

## Seed Storage in the NT Tropics

A.G. Cameron, Principal Seeds Agronomist, Darwin

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### INTRODUCTION

Producers often need to carry over and store seed from one wet season to the next. This seed can be the remainder of a lot not planted during the current wet season for various reasons, or from an ad-hoc on-farm harvest from a saved pasture or a crop retained to use as seed.

Long periods of hot, humid weather as experienced in the Top End lead to the rapid deterioration of stored seed or grain. This particularly affects seed viability.

Commercial seed must maintain high levels of germination to be useful for producers.

Factors which can influence the longevity of stored seed include field conditions where the seed crop was grown, how it was dried, and how it was stored.

The most important storage conditions are temperature and relative humidity.

### FIELD CONDITIONS

Where, when and how a crop is grown can affect seed storage life. High temperatures, and rain or dew during crop-maturing can lead to deterioration in seed quality before and after harvest. Immature seed and seed mechanically damaged during harvesting can suffer severe loss of viability during storage. Poor quality seed will lose its viability even under ideal storage conditions.

### DRYING CONDITIONS

High seed moisture content is the main cause of loss of seed viability and vigour. High moisture causes heating, fungal activity (moulding) and encourages increased insect activity.

Seed harvested early, with a high moisture content will generate heat if left in bulk.

The seed can be spread out to dry, or preferably dried by blowing unheated or heated air through it.

Unheated air is effective if the relative humidity of the air is lower than the equilibrium moisture content of the seed. This is not usually the case in the Top End, except during the dry season.



Recommended minimum air-flow rates (cubic metres of air per minute [c.m./m.] ) for drying seed with unheated air under average conditions are:

- For seed at 25% moisture content, 5.43 c.m./m./cubic metre of seed.
- For seed at 22% moisture content, 4.12 c.m./m./cubic metre of seed.
- For seed at 18% moisture content, 3.02 c.m./m./cubic metre of seed.
- For seed at 15% moisture content, 2.20 c.m./m./cubic metre of seed.

Heated air allows quicker drying. Most seeds can tolerate up to 50°C for short periods, but too high a temperature will kill the seed.

The following are the maximum drying temperatures that can be used with safety:

<b>Seed moisture content</b>	<b>Maximum drying temperature (°C)</b>
Over 18%	32
10 - 18%	38
Under 10%	42

## **STORAGE CONDITIONS**

The temperature and relative humidity (RH) of the store are the most important factors affecting seed quality. Under ideal storage conditions, both RH and temperature should be kept low.

Seeds are hygroscopic, that is they absorb moisture from wet air and lose moisture to dry air. Maintaining a safe moisture content for storage requires a corresponding low RH, which can be achieved by -

- a) Building the storage facility in a location where RH is naturally low.
- b) Reducing the RH to a favourable level by conditioning the storage environment with refrigeration and dehumidification.
- c) Storing dry seed in impervious sealed containers e.g. sealed tins or drums, thick plastic bags or bottles.



## **RULES OF THUMB ARE**

When seed moisture content is between 5% and 14%, each 1% reduction in moisture content approximately doubles seed storage life.

When storage temperature is between 0°C and 50°C, each 5°C decrease in storage temperature approximately doubles seed storage life.

## LENGTH OF STORAGE

Conditions for safe storage of seed depend on the expected duration of storage.

### 1. Short term storage (one to nine months, one dry season)

Good quality seed can be safely stored under the following conditions:

- 30°C - 50% RH (maximum seed moisture content of 12% for cereals to 8% for oil seeds).
- 20°C - 60% RH (maximum seed moisture content of 13% for cereals to 9.5% for oil seeds).
- Other combinations of temperature and RH similar to the above, such as 20°C - 50% RH which approximates normal room air conditioning.

### 2. Intermediate storage (18-24 months, two dry seasons)

Successful storage can be arranged using the following conditions:

- 30°C - 40% RH (seed moisture content ranging from maximum of 10% for cereals to 7.5% for oil seeds).
- 10°C - 60% RH (seed moisture content ranging from 12% for cereals to 9% for oil seeds).
- Other combinations of temperature and RH similar to the above.

### Long term storage (up to 10 years)

Long term storage can be achieved by cold dry conditions, between 0 and 5°C and 30 and 40% RH.

These conditions can be obtained only in a well-insulated storage room with refrigeration and dehumidification equipment. Specifications and designs for this type of seed store are available from the literature.

DPIFM has stored crop and pasture seed at 10°C in seed stores at Douglas Daly Research Farm (DDRF) and Berrimah Farm for six to 10 years with minimal loss of viability.

## OPEN STORAGE

Seed kept at ambient temperature and humidity in the Top End is vulnerable to rapid deterioration in viability.

Ambient climatic conditions at two selected sites in the NT are shown in Table 1.

**Table 1.** Mean monthly maximum and minimum temperature and RH for Katherine Post Office and DDRF

Site	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
<b>DDRF</b>												
9 am RH	82	92	81	69	64	77	66	63	65	64	68	71
3 pm RH	56	67	61	61	41	39	41	41	24	28	37	43
Max T	34	32	34	35	33	31	31	34	36	37	38	36
Min T	24	23	23	20	17	13	14	16	18	21	23	23
<b>Katherine PO</b>												
9 am RH	76	80	76	65	56	54	50	49	50	56	60	70
3 pm RH	52	54	49	37	34	31	27	24	23	27	32	43
Max T	32	32	32	32	29	27	27	30	34	36	36	34
Min T	24	24	23	21	17	15	13	15	20	24	25	25

The combinations of temperature and RH, even in Katherine are generally over the 30°C - 50% RH or 20°C - 60% RH for safe short term storage of seed.

Most seed in open storage i.e. a shed in the NT, particularly pasture grass seed or grains will not remain viable from one wet season to the next. Material stored in this way will often have no viable seeds when tested in November or December prior to a planned sowing.

Pasture legume seed with a high content of hard seed loses its viability more slowly as germinable seed which die are replaced by hard seeds which become germinable.

## **HYGIENE**

Seed stores need to be kept clean and free of spilled seed, which will encourage insect and rodent pests (rats and mice).

The seed storage area should be free of ledges, corners, and sharp angles where insects and rubbish can collect. It should also be airtight in case the seed needs to be fumigated to control pests.

## **SUMMARY**

Seed will usually not retain viability from one wet season to the next under ambient conditions in the Top End of the NT.

The minimum requirement for carry - over seed is an air-conditioned room. This will be perfectly adequate to hold good seed for one dry season with minimal loss of viability.

For longer - term storage, a well-constructed cool room with controlled temperature and humidity is required.

## **WARNING**

Pasture plants have the potential to become weeds in certain situations. To prevent that, ensure that pasture seeds and/or vegetative materials are not inadvertently transferred to adjacent properties or road sides.

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