

Post-Harvest Storage of Pulses

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Good management of peas, lentils, faba beans, chickpeas, dry beans, and soybeans in storage will help maintain the value of your crop.

Moisture Specifications

The Canadian Grain Commission (CGC) sets seed moisture content for grading and storage purposes. Most pulse crops are considered to be dry enough for safe storage at the CGC dry grade (Table 1). Processors also generally follow the same CGC moisture specifications when purchasing seed.

Seed Moisture Content at Harvest

Because many pulse crops crack or split when harvested at dry seed moisture content or lower, harvesting at the tough seed moisture stage is sometimes recommended to reduce seed damage. Subsequent aeration is then required to dry the crop down for safe storage.

Peas: Threshing peas at 18 to 20 per cent seed moisture content is recommended to lower the risk of seed cracking or peeling and reduce shatter losses. Threshing over 20 per cent moisture can increase the amount of earth tag. Seed damage will increase as the seed moisture goes below 16 per cent.

Lentils: Combining green lentils at 16 to 18 per cent moisture is considered ideal, assuming drying to 14 per cent can be accomplished.

Faba Beans: Faba bean harvest can start at 18 to 20 per cent moisture, but seed should be aerated down to 16 per cent moisture for safe storage.

Chickpeas: Chickpea combining can start when seed reaches about 18 per cent moisture. Avoid combining chickpeas that are wet or immature. Chickpea seed colour is an important grading factor. The stage of the crop should be closely monitored, as harvesting too early increases the chance of green seed in the crop, which lowers the grade and value of the grain. Deductions are implemented if immature green seeds comprise more than 0.5 per cent in Kabuli, and more than one per cent in Desi chickpeas.

Dry Beans: To minimize seed damage during threshing, dry beans should be combined when the seed is at a moisture content of 16 to 22 percent. For long-term storage moisture content of beans should

be at 14 per cent and 16 per cent moisture is acceptable for short-term storage.

Soybeans: Direct combine soybeans when the pods are dry and the seeds are hard. Combining can take place when seed moisture is below 20 per cent, but soybeans should be stored at less than 14 per cent. Seed damage is high when soybeans are harvested at less than 12 per cent moisture, and harvest losses can also be high under dry conditions.

Aeration and Drying

General recommendations for aeration and drying follow the same recommendations for cereals and oilseeds. Natural air can be effectively used to remove moisture from pulses and may actually work better than for cereals because of reduced static pressure. Given the correct temperature and relative humidity, natural air drying can be successfully used to dry and/or cool pulses to safe storage moisture content and temperature.

Because pulses are generally harvested early, the weather works well for effective natural air drying, and there is no need for additional heat with a supplemental heating system. If supplemental heating is being used, limit the temperature increase to 10°C or less, and ensure you are using a Canadian Standards Association (CSA) certified heating system.

Safe Storage Moisture and Temperatures

Crop stored under cool, dry conditions can be stored for long periods, but as seed moisture or temperature rises, storage length becomes less.

Peas: See Table 2 for safe storage details.

Lentils and Chickpeas: As moisture levels decline, especially in Kabuli chickpea types, seed begins to shrink from the seed coat and becomes more susceptible to damage in handling at less than 13 per cent (Table 3).

Dry Beans: Spoilage occurs when initial temperature ranges from 5°C to 42°C with respective moisture from 20 to 10 per cent moisture content. Moisture content of 18 per cent or less is recommended for safe storage of dry beans. Dry beans are often stored and traded at

Table 1. Canadian Grain Commission Moisture Specifications

	Peas	Green Lentils	Red Lentils	Faba Beans	Chickpeas	Beans	Soybeans
Dry	< 16	< 14	< 13	< 16	< 14	< 15	< 14
Tough	16.1 - 18	14.1 – 16	13.1 – 16.0	16.1 - 18	14.1 - 16	15-18	14.1 – 16.0
Damp	> 18	> 16	> 16	> 18	> 16	> 18	16.1 - 18

Source: Canadian Grain Commission

17 per cent moisture content, but are considered dry at 16 per cent. Drying beans below seed moisture content of 16 per cent makes the seed coat more fragile and susceptible to cracking or splitting when handled.

Table 2. Number of Weeks for Safe Storage of Peas at the Specified Grain Moisture Content and Storage Temperature

Temperature (°C)	Moisture Content of Seed (%)				
	12	14	16	18	21
	Maximum Safe Storage (Weeks)				
26	31	16	7	4	2
20	55	28	13	7	4
16	100	50	20	12	6
10	200	95	38	20	21
6	370	175	70	39	20

Source: Sokhansani, 1995

Table 3. Number of Weeks for Safe Storage of Lentils at the Specified Grain Moisture Content and Storage Temperature

Temperature (°C)	Moisture Content of Seed (%)					
	12	13	14	16	18	21
	Maximum Safe Storage (Weeks)					
25	31	16	13	7	4	2
20	55	28	23	13	7	4
15	100	50	40	20	12	6
10	200	95	80	38	20	21
5	370	175	150	70	39	20

Table 4. Estimated Number of Weeks for Decreased Germination to Occur in Dry Beans

Temperature (°C)	Moisture Content of Seed (%)							
	11	12	13	14	16	18	20.5	23
	Maximum Safe Storage (Weeks)							
25	31	22	16	11	7	4	2	0.5
20	55	40	28	19	13	7	3.5	1.5
15	100	75	50	30	20	12	6	3
10	200	140	95	60	38	20	11	4.5
5	370	270	170	110	70	39	20	9

Source: Extrapolated from pea data, Sokhansani, 1995

Table 5. Length of Safe Storage for Soybeans Depending on Target

Moisture Content (%)	Market Stock	Seed Stock
10 - 11	4 years	1 year
10 – 12.5	1 to 3 years	6 months
13 - 14	6 to 9 months	Questionable, check germination
14 - 15	6 months	Questionable, check germination

Source: Protection of Farm-Stored Grains, Oilseeds, and Pulses from Insects, Mites, and Moulds. Agriculture and Agri-Food Canada, 1851/E (revised)

Beans can also be discounted if they are too dry (below 15 per cent moisture) (Table 4).

Soybeans: The safe storage moisture content for commercial seed is 13 per cent for storage up to one year and 10 per cent for storage up to five years. These guidelines do not take into consideration such things as accumulation of fines under the spout lines (Table 5).

Artificial Heat Grain Drying

For peas and lentils, air temperatures should not exceed 45°C to preserve germination. The sample should not be dried more than four to five percentage points per pass through the dryer. For beans, supplemental heat drying temperatures should be restricted to a maximum of 27°C to 32°C to avoid germination loss. Faba beans should be dried at a maximum of 32°C and should be done in two stages if more than five per cent moisture content is removed. The maximum safe drying temperatures are 43°C for soybeans intended for seeding purposes, and 49°C for soybeans intended for commercial use.

Storage Time

When conditioned properly, pulses can be stored for up to two years, however pulses can oxidize and lose colour and grade. Lentil varieties with green seed coats will discolour with age, reducing the grade. Producers should store lentils in dry, dark conditions. Seed from successive years should not be mixed, as the oldest seed may cause downgrading of the entire sample. Lentils should not be stored through a second summer season, in order to avoid excessive discolouration and downgrading.

Handling

Pulses should be moved as little as possible, and handled gently to reduce chipping and splits. Use belt conveyors instead of augers if possible. If using augers, run the auger full and at a reduced speed. Use bean ladders on equipment to minimize the dropping of seed from more than a few feet.

Lentil, faba bean, pea, and dry bean seed should not be handled at temperatures below -20°C, as the seed is more susceptible to chipping and peeling at low temperatures.

Frost Damaged Pulses

The same considerations for safe storage apply to frost damaged pulses. Dry and cool to safe moisture and temperature levels. Special consideration should be given if green seed or green weed seeds are present. Generally, the lower the quality (and higher the level of fines, etc.), the more likely you will see formation of hot spots or localized areas of spoilage that may spread to the rest of the bin.

Monitoring

Stored pulses should be monitored regularly for hot spots and other changes in moisture and temperature. A variety of manual and automated systems are available to help keep track of seed condition. Peas and chickpeas often respire or sweat after being placed in storage. Extra care should be taken to monitor the grain inside the bin for moisture build-up or spoilage.