Pulse Advisor Newsletter
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Long-Term Storage of Lentils, Peas, and Chickpeas

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India's import duties of 33 per cent on lentils, 60 per cent on chickpeas, and 50 per cent on peas have some farmers considering holding on to these pulses while looking for other markets, or hoping for a timely solution to the trade issue. Little research has been conducted on how to safely store lentils, chickpeas, and peas over the longer term, and how long-term storage will impact quality. However, based on known principles of storage, and extrapolating best practices from other crops like canola, long-term storage of pulses may be possible.

Store at Safe Moisture and Temperatures

The foundation for long-term storage is dry, cool grain. 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. Processors also generally follow the same CGC moisture specifications when purchasing seed.

Crop stored under cool, dry conditions can be stored for long periods, but as seed moisture or temperature rises, storage length becomes less. The drier and cooler the grain, the safer it is during storage. The target temperature for all grains provided they are dry is 15°C or lower.

Noel White, formerly with the Cereal Research Centre with Agriculture and Agri-Food Canada at Winnipeg developed safe storage charts for different grains, including peas. Pea storage information has been extrapolated to cover green and red lentils.

Even if the crop went into the bin dry, cooling with aeration will help extend the safe storage timeframe, and is especially important for longer-term storage. For example, using the safe storage charts, green lentils at 14 per cent moisture content and at a 20°C temperature could be safely stored for about 23 weeks, but if the temperature was cooled to 10°C , the lentils could be safely stored for 80 weeks.

Monitoring

Peas and chickpeas often respire or go through a sweat after being placed in storage. Extra care should be taken to monitor the grain inside the bin for moisture build-up or spoilage. Moisture levels should be tested often for large Kabuli chickpea types, because seed testing dry can sometimes hide seed with higher moisture levels internally in the grain mass. Monitor 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.

During the winter, cold air moves downward along the outside of the bin and moves warm, moist air up through the core of the grain bin. Pulse growers should monitor their bins, especially where high moisture may concentrate. If high moisture areas become a concern, recommendations for other crops like canola include moving one-third of the bin to disrupt the moisture cycle and help cool the centre grain mass.

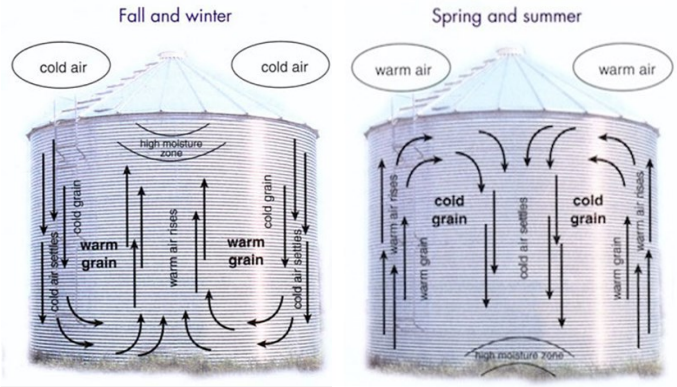

Figure 1. Moisture migration cycles in a bin by season.
Source: Canola Council of Canada

In the spring, the opposite moisture migration cycle occurs. Warm air moves upwards along the bin walls and cold air carries moisture down the core of the bin, concentrating moisture near the centre/ bottom of the bin. This can create potential concentrations of warm, moist air where spoilage may begin.

The Prairie Agricultural Machinery Institute in Humboldt researched canola and found that there was no advantage to aeration in the spring with very dry canola. Temperature changes occurred within the bin, but no moisture migration was observed. Leaving the bin alone was the best strategy. Whether this would be the same for peas, lentils, and chickpeas is unknown, as pulses are stored at a higher moisture content and have larger seed size, which may allow moisture migration to occur. The best advice is to continually monitor bins for any high moisture concentration.

Quality Considerations

Pulses that contain tannins in their seed coats oxidize over time, losing colour and grade. Peas (except for maple and dun varieties), Kabuli chickpeas, zero-tannin faba beans, and zero-tannin lentils have zero-tannin seed coats so these should store well. Other pulses will tend to oxidize and darken in colour over time in storage.

Discolouration is a function of oxidation and light degradation. Producers should store lentils in dry, dark conditions. Ensuring proper cool, dry, and dark storage conditions may help lengthen the time before any discolouration occurs. Seed from successive years should not be mixed, as the oldest seed can cause downgrading of the entire sample. The current recommendation for green lentils is that they should not be stored through a second summer season, in order to avoid excessive discolouration and downgrading.

Handling

If pulses require handling, they should be moved as little as possible, and handled gently to reduce chipping and splits. Use belt conveyors instead of augers. 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 and pea seed should not be handled below -20°C, as they are more susceptible to chipping and peeling at low temperatures.

The irregular shape of chickpeas really must have gentle movement in order to keep from breaking the beaks from the seed coat, and to ensure that the seed coat integrity is not damaged.

Stored Grain Insects

Stored grain insects are generally not a problem in pulses that are stored under dry, cool conditions. Blaine Timlick with the CGC says that while there are several weevils that exist in Canada, in 20+ years he has only seen pulses infested on three occasions. This includes railcar delivery into terminal monitoring, and the sampling/testing that the CGC performs during vessel loading.

In general, all bins should be monitored not only for moisture and temperature, but also the presence of insects. Timlick suggests that if the temperature and moisture are managed, then quality should be maintained for taste and nutritional value.

Insects very rarely infest pulse crops. Monitoring should take place as standard practice. When monitoring pulse bins, insects that could be watched for include: vetch weevil (*Bruchus brachialis Fahr*), pea weevil (*Bruchus pisorum (L.)*), broadbean weevil (*Bruchus rufimanus Boh),* and bean weevil (*Acanthoscelides obtectus (Say)*).

More information on stored grain insects can be found at the CGC website.

Canadian Grain Commission Moisture Specifications for Pulse Crops.

	Peas	Green Lentils	Red Lentils	Faba Beans	Chickpeas	Dry Beans	Soybeans
Dry	< 16	< 14	< 13	< 16	< 14	No dry	< 14
Tough	16.1 - 18	14.1 – 16	13.1 – 16.0	16.1 - 18	14.1 - 16	No tough grade	14.1 – 16.0
Damp	> 18	> 16	> 16	> 18	> 16	> 18.0	16.1 - 18

Source: Canadian Grain Commission

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

Moisture content (%)	**12**	**14**	**16**	**18**	**21**
Temp. (°C)	**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: Sokhansanj, 1995

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

Moisture Content (%)	**12**	**13**	**14**	**16**	**18**	**21**
Temp (°C)	**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

Source: Extrapolated from pea data, Sokhansanj, 1995.