

Quality of the late harvest (November 2016) of western Canadian Canola

Véronique J. Barthet
Oilseeds Program Manager

Contact: Véronique J. Barthet
Oilseeds Program Manager
Tel : 204-984-5174
Email: veronique.barthet@grainscanada.gc.ca
Fax : 204-983-0724

Grain Research Laboratory
Canadian Grain Commission
1404-303 Main Street
Winnipeg MB R3C 3G8
www.grainscanada.gc.ca

The 2016 harvest conditions were challenging; timewise it is considered the longest harvest in western Canada, starting early in August and ending, unfinished, in November (Figure 1). In early to mid-October heavy rain and snow stopped the harvest for over 3 weeks in some parts of Alberta and Saskatchewan (Figure 2). At the time 23% and 33% of the canola grown in Saskatchewan and Alberta respectively was not yet harvested. Improved weather conditions allowed a large part of this “snowed-in” canola to be harvested in November. Samples of this “snowed-in” canola were analyzed; this report presents the quality of these samples compared to the “normal” 2016 canola, i.e. harvested before the snow.

Figure 1 – Harvest progress in Saskatchewan and Alberta for the 2015 and 2016 growing seasons. Provincial crop reports were used to estimate the harvest progress in each province.

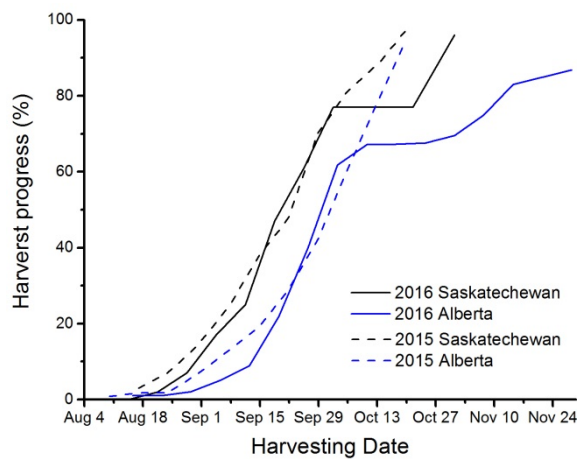
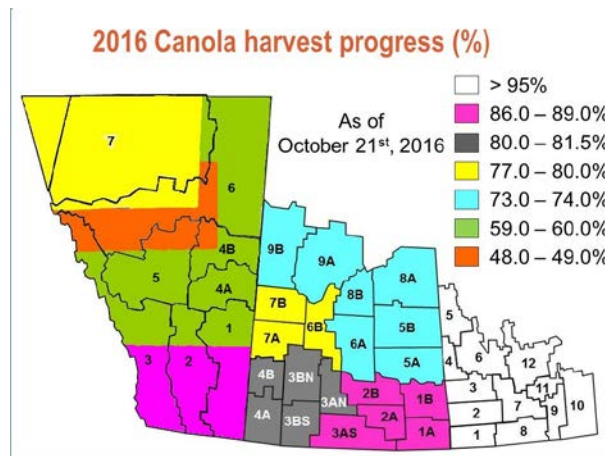


Figure 2 – Canola harvest progress as of October 21st, 2016. Provincial crop reports were used to estimate the harvest progress in each province.



Quality and grade

Background information, such as variety, time of seeding, swathing, harvesting and/or method of harvest (i.e. straight cutting) is collected for the canola samples received by the Canadian Grain Commission annual harvest survey program. This year, this additional data helped to assess the effect of the snow on the canola seed quality.

Oil, protein, glucosinolate and chlorophyll contents of the seed and fatty acid composition and the free fatty acid (FFA) content of the oil are some of the parameters that define seed quality. Chlorophyll and FFA are negative factors for quality and they have to be removed during oil processing. FFA is produced by the oil breaking down by chemical, enzymatic or microbiological activity whereas high chlorophyll is a sign of seed immaturity. High FFA content is an indication of poor seed quality and reflects seed damage.

The results presented in the tables below include all the samples that were provided by producers for the “snowed-in” canola research project and collected/analyzed up to January 20th, 2017. As we received samples during harvest, some are randomly taken and fully analyzed using referenced analytical methods. The results from these samples were also included in Table 1.

To study the effect of the snow on the canola harvest in 2016, all samples analyzed by using reference analytical methods were grouped using the cutting/swathing/harvest dates supplied by the producers on the sample envelopes. The assumption was made that samples harvested in November were harvested after the snow even if this was not clearly indicated on the envelope. Samples identified as “snowed-in” canola by producers, were added to the November samples. The summarized results of the quality analyses are presented in Table 1. To facilitate the comparison, the 2016 canola quality results for Canada and the three western provinces are also included in this report and presented in Table 2.

The results (Table 1) showed no differences in oil content ($p = 0.7295$), protein content ($p = 0.6097$) and glucosinolates content ($p = 0.9379$) for samples graded Canola No. 1 Canada. Some differences were observed for the chlorophyll content averages, with the tested September samples showing slightly higher values as compared to the October or November samples, however these differences were not very significant ($p = 0.0850$). Free fatty acid content (FFA) averages were statistically very different among the September, October and November samples ($p < 0.0001$). The November samples had the higher FFA average (0.39 % as oleic acid) when compared to September (0.17%) and October (0.16%). The FFA medians were 0.12%, 0.15% and 0.28% as oleic acid for the samples harvested in September, October and November respectively (data not shown in the table). Comparing the median for FFA has the advantage of not skewing the comparison by lessening the effects of the extreme high or low results on the data; the median differences confirmed the differences observed between the three sets of samples using the averages.

There were noticeable quality differences for the samples in the lower grades; however the sample size (13 samples in total) was too small to allow statistical comparison. The down grading was due to different factors such as immaturity, seed damage, admixture and excreta.

The seeding date reported by the producer on the sample envelopes showed that the canola was seeded in May, suggesting that the crop was fully mature when harvested. This was confirmed by the low chlorophyll contents of all the samples graded as Canola No. 1, Canada.

Canola still in the field when the snow arrived was left in a high moisture environment; leading to endogenous seed enzyme activation. Low temperatures likely slowed the process but the breakdown in oil was still occurring. After harvest the “snowed-in” canola seeds were likely dried down to allow seed storage. Reducing the moisture content of the seeds slowed the enzymatic process and additional FFAs were no longer produced and processed by the seeds. In the field, the low temperatures, the amount of time under the snow and the drying timing contributed to the wide range of FFA contents, 0.07% to 1.35%. The internal enzymatic activity is not visually detectable, no visual damage could be associated with “snowed-in” canola (weathered, sprouting, discolored and/or covered with rime) and were detected in the snowed-in canola samples. As a result most of the canola harvested after the snow, even with high FFA, were graded Canada, No. 1 Canola.

The study had only 40 samples of canola graded Canola No. 1 Canada that were clearly identified as harvested after snow fall, this might be considered a low number compared to the 1827 received for the 2016 harvest program. However, the statistical differences presented in Table 1 suggested that the “snowed-in” canola condition, for reasons mentioned earlier, can lead to high FFA in the oil. These FFAs must be removed during oil refining as they reduce the quality of the oil resulting in poor storage stability, bad taste and bad smell. There are international specifications for FFA content in crude oil, the limit being 2%. However, this specification limit is the worse-case scenario and it is considered that seed FFA levels have to be much lower than 0.7% for top quality seed.

Table 1: Summary statistics and sample results (Samples analyzed up to January 20, 2017):

Grade	Harvest - combined	N Obs	Oil content (%, 8.5% moisture)			Protein content (%, 8,5% moisture)			Chlorophyll content (mg/Kg)		
			Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
1	September	32	43.8	38.4	48.8	20.7	15.2	26.0	12	4	37
1	October	26	44.4	41.6	47.9	20.4	17.5	24.4	13	2	28
1	November	40	44.5	40.9	48.0	20.9	17.1	23.9	14	8	25
2	September	2	42.6	42.5	42.6	21.8	21.4	22.1	18	16	19
2	October	3	46.0	45.9	46.0	20.4	19.4	22.3	31	25	35
2	November	1	44.0			20.3			41		
Sample	November	1	44.6			20.2			12		
Sample	October	5	43.1	37.5	49.0	22.6	16.6	28.4	18	14	25

Grade	Harvest - combined	N Obs	Total glucosinolates ($\mu\text{mol/g}$, 8.5% moisture)			Free Fatty Acid content (% as oleic acid in oil)		
			Mean	Min	Max	Mean	Min	Max
1	September	32	10	5	15	0.17 ^a	0.03	0.62
1	October	26	10	7	14	0.16 ^a	0.04	0.64
1	November	40	10	7	12	0.39 ^b	0.07	1.35
2	September	2	11	11	11	0.39	0.29	0.50
2	October	3	9	8	11	0.16	0.08	0.31
2	November	1	10			0.13		
Sample	October	5	12	8	16	1.08	0.11	2.80
Sample	November	1	8			0.67		

^{a,b}. FFA averages with the same letter are not statistically different.

Table 2: Summary results of the 2016 canola harvest:

Grade	Harvest - combined	N Obs	Oil content (% , 8.5% moisture)			Protein content (% , 8.5% moisture)			Chlorophyll content (mg/Kg)		
			Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
1	Manitoba	417	43.5	37.5	49.5	20.6	16.4	24.8	10	4	27
	Saskatchewan	806	44.8	37.1	50.0	19.6	15.6	26.0	11	4	38
	Alberta	604	43.9	38.9	49.5	20.5	15.1	26.0	13	4	41
	Canada	1827	44.3	37.1	50.0	20.1	15.1	26.0	11	4	41
2	Manitoba	12	41.4	39.2	43.8	22.4	20.7	24.7	18	8	33
	Saskatchewan	15	43.6	40.1	48.2	20.0	16.8	22.7	22	10	54
	Alberta	24	42.4	37.4	46.3	21.9	19.1	26.2	25	5	49
	Canada	51	42.7	37.4	48.2	21.3	16.8	26.2	23	5	54
3	Canada	11	43.2	41.7	45.0	19.9	18.0	21.4	18	7	45
Sample	Canada	26	41.8	30.4	46.0	20.0	17.1	25.6	17	4	51

Grade	Harvest - combined	N Obs	Total glucosinolates (µmolmicromole/g, 8.5% moisture)			Free Fatty Acid content (% as oleic acid in oil)
			Mean	Min	Max	Mean
1	Manitoba	417	10	4	15	0.34
	Saskatchewan	806	10	4	16	0.16
	Alberta	604	10	6	19	0.21
	Canada	1827	10	4	19	0.20
2	Manitoba	12	11	10	13	1.22
	Saskatchewan	15	12	8	14	0.17
	Alberta	24	10	7	15	0.73
	Canada	51	11	7	15	0.58
3	Canada	11	10	7	13	0.32
Sample	Canada	26	12	8	30	0.32