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Effect of free fatty acid on the shelf-life of overwintered canola seeds

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Background:

The 2019 canola growing season extended well into 2020 as an early winter, with rain and large snow accumulations, stopped the 2019 fall harvest. Earlier reports (Daun *et al*. 1986) showed that overwintering mature canola led to seed discoloration and high contents of free fatty acids (FFAs).

Objective:

The aims of the project were to assess the quality of the 2019 overwintered (2020 spring harvested) canola seeds, to determine whether degradation still occurs in seeds during storage and to assess which parameters could affect the storability of the seeds using accelerated oxidative stability tests to predict the shelf-life of the seeds (SL_{20}).

Methods:

Canola seed quality was predicted using NIR spectroscopy and confirmed using reference methods. The FFA contents were determined upon receiving and after storage. The quality of the overwintered canola seeds was compared to the quality of the 2019 fall harvested canola seeds. Accelerated oxidation studies were run at various temperature to extrapolate the shelf-life or storage life of the seeds at 20°C (SL_{20}).

Results:

There were no real differences in the oil and protein contents of the 2019 overwintered canola seeds when compared to the 2019 fall harvested ones.

The FFA contents of the overwintered seeds were higher than the one of the 2019 fall crop ($p = 0.0001$). FFA increased during storage in all seeds (overwintered and fall samples), however the FFA contents of the stored fall samples were very acceptable after 9 months of storage (0.34% average and 0.29% median) which was not the case for the overwintered samples (0.63% average and 0.59% median). The differences between the initial FFA and the stored seed FFA results were proportional to the initial FFA content ($R^2 = 0.7084$), suggesting that once started, FFA production (TAG degradation) kept occurring independently of the seed grades.

Accelerated oxidation studies showed higher Ip values and SL_{20} results for the fall harvested canola samples when compared to the overwintered canola samples ($p < 0.0001$ and $p = 0.0066$, respectively). The SL_{20} range for the No. 1 overwintered canola was very large (0.54 to 3.93 years versus 1.78 to 3.36 years), making seed storage unpredictable.

The FFA was the quality parameter that was affected the most to SL_{20} of the seeds whereas as oil content and fatty acid composition had no effect.

Conclusions:

The results of the project highlighted the difficulty in handling overwintered canola. Some samples were of excellent quality, high oil, low chlorophyll and low FFAs whereas other samples were quite damaged (high FFA) making the management of the overwintered canola seeds difficult. The FFA content was the main factor responsible of the lowering the seeds shelf-life. Once started, the seeds degradation due to FFA continued leading to more damage within the seeds.

References:

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