Grain Research Laboratory Technical Bulletin

Title	Effects of application of food grade mineral oil to peas, lentils and food-type soybeans on quality attributes
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Summary

This study was conducted to examine the impact of mineral oil application on quality of peas, lentils and food-type soybeans. Results indicated that mineral oil applied at levels from 0.02 to 0.06% by weight (w/w) had no significant impact on specific quality attributes.

Goals and objectives

The purpose of application of food grade mineral oil is to control dust emissions during grain handling at terminal elevators. The maximum amount allowed for application of mineral oil is 0.02% w/w. The objective of this study was to investigate if the application of food-grade mineral oil at levels of 0.02, 0.04 and 0.06% (w/w) to peas, lentils and food-type soybeans would affect specific quality parameters.

Materials and methods

Pea and lentil samples for this study were obtained from Canadian pulse processors. The project looked at

- two green pea samples
- three yellow pea samples
- three green lentil samples (one large size, one medium size, one small size)
- two red lentil samples
- four red lentil samples (for the dehulling study)
- four food-type soybean samples (three generic and one natto type) from the 2018 Harvest Sample Program

Each 4 kg sample was mixed and then split into eight subsamples using a Boerner divider (Seedburo Equipment Company, Chicago, IL). Each subsample was then treated with food-grade mineral oil (C330779-1L) from Sigma-Aldrich (St. Louis, MO, USA) at levels of 0.0 (control), 0.02, 0.04 and 0.06% w/w, respectively, in duplicate. An airbrush (TCP Global, San Diego, CA) connected to an air compressor was used to apply mineral oil to the samples. 40 treated pea, 48 treated lentil, 32 treated red lentil (dehulling study) and 32 treated food-type soybean samples were analyzed.

The following tests were performed on the samples according to published or standard methods.

Peas and lentils

- Physical characteristics (100-seed weight and water absorption) (1)
- Chemical composition (protein, moisture, starch and ash content) (1,2)
- Functional properties (water-holding and oil emulsifying capacity) (1,5)
- Cooking quality of peas (cooking time and firmness of cooked seeds) (1,4)
- Dehulling quality of red lentils (dehulling efficiency and color) (3)

Food-type soybeans

- Physical characteristics (100-seed weight and water absorption) (1)
- Chemical composition (protein and oil content) using near-infrared (NIR) spectrometer

- Sugars and oligosaccharides (sucrose, raffinose, stachyose and verbascose content) (6)

Data were assessed by analysis of variance using the Statistical Analysis System (V.9.4, SAS Institute, Cary, NC). The Duncan's multiple range test was used to separate means and significance was accepted at $p<0.05$.

Results

Effect on pea quality attributes

Figure 1 shows the results of applying mineral oil to peas at levels from 0.0 to 0.06% (w/w) on certain quality attributes. Results showed that application of mineral oil had no significant effect on seed weight, water absorption capacity, cooking time and firmness of cooked peas. No significant difference in protein, starch and ash content was observed amongst treated pea samples. Application of mineral oil had no significant effect on water holding capacity or oil emulsifying capacity of pea flours.

Effect on lentil quality attributes

Figure 2 shows the results of applying mineral oil to lentils at levels from 0.0 to 0.06% (w/w). Application of mineral oil had no significant effect on seed weight, water absorption capacity, protein, starch and ash content of lentils. There was no significant effect of mineral oil on dehulling efficiency, the amount of powder produced, and the amount of broken seeds produced during dehulling of red lentils. No significant difference in the color (redness) of dehulled whole seeds and dehulled split seeds was observed.

Effect on food-type soybeans quality attributes

Figure 3 shows the results of applying mineral oil to food-type soybeans. Results indicated that application of mineral oil at levels from 0.02 to 0.06% (w/w) had no significant effect on seed weight, water absorption capacity, protein, oil and sucrose content in food-type soybeans when compared to untreated soybeans.

Conclusion

The application of food grade mineral oil to peas, lentils and food-type soybeans at levels from 0.02 to 0.06% w/w has no significant impact on their specific quality attributes when compared to untreated soybeans.

References

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Appendix

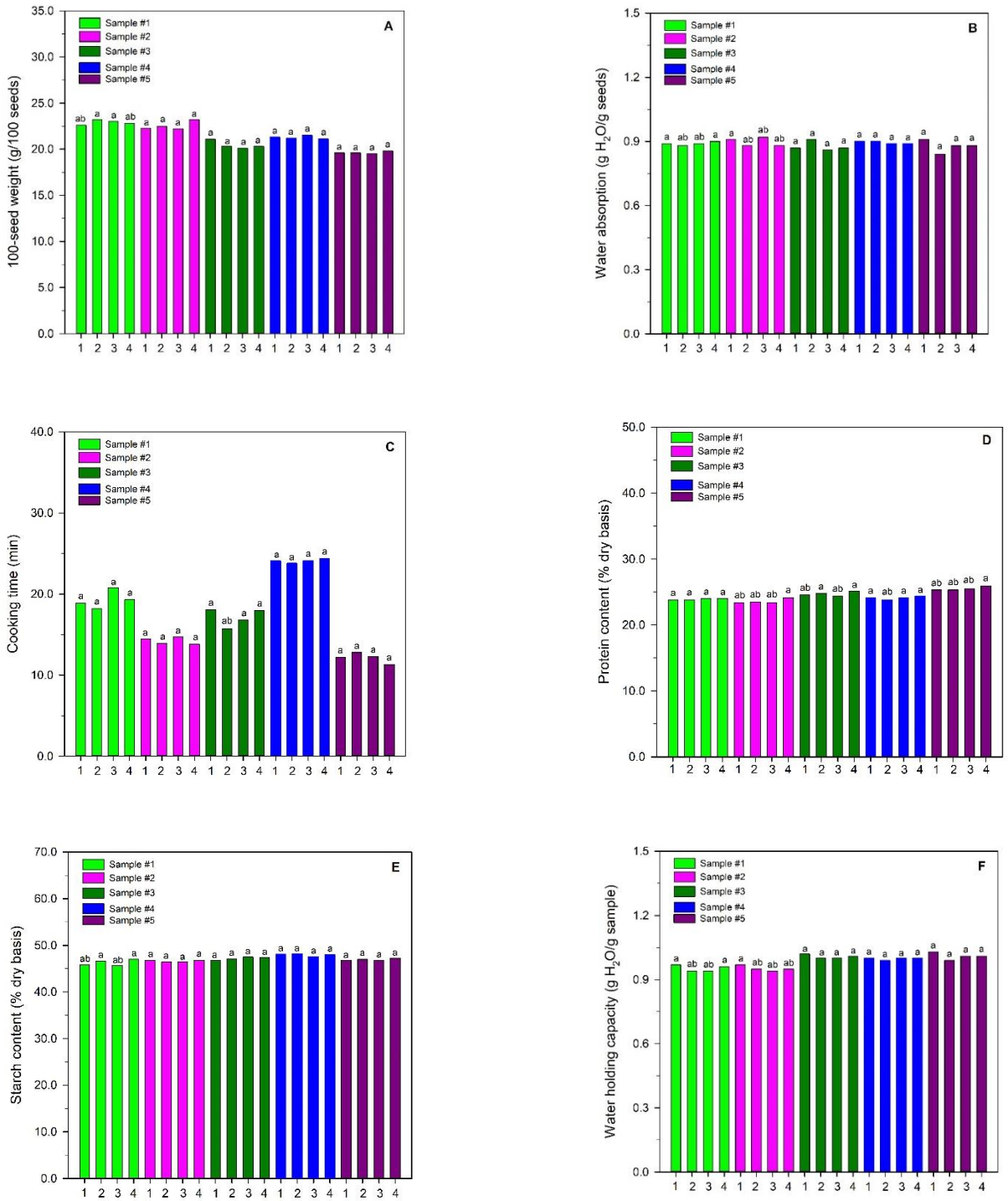

Figure 1 Effect of application of food grade mineral oil to pea samples on (A) 100-seed weight, (B) water absorption capacity, (C) cooking time, (D) protein, (E) starch and (F) water holding capacity of pea flour. X-axis: 1–0.0% mineral oil applied; 2–0.02% (w/w) applied; 3–0.04% (w/w) applied; and 4–0.06% (w/w) applied.

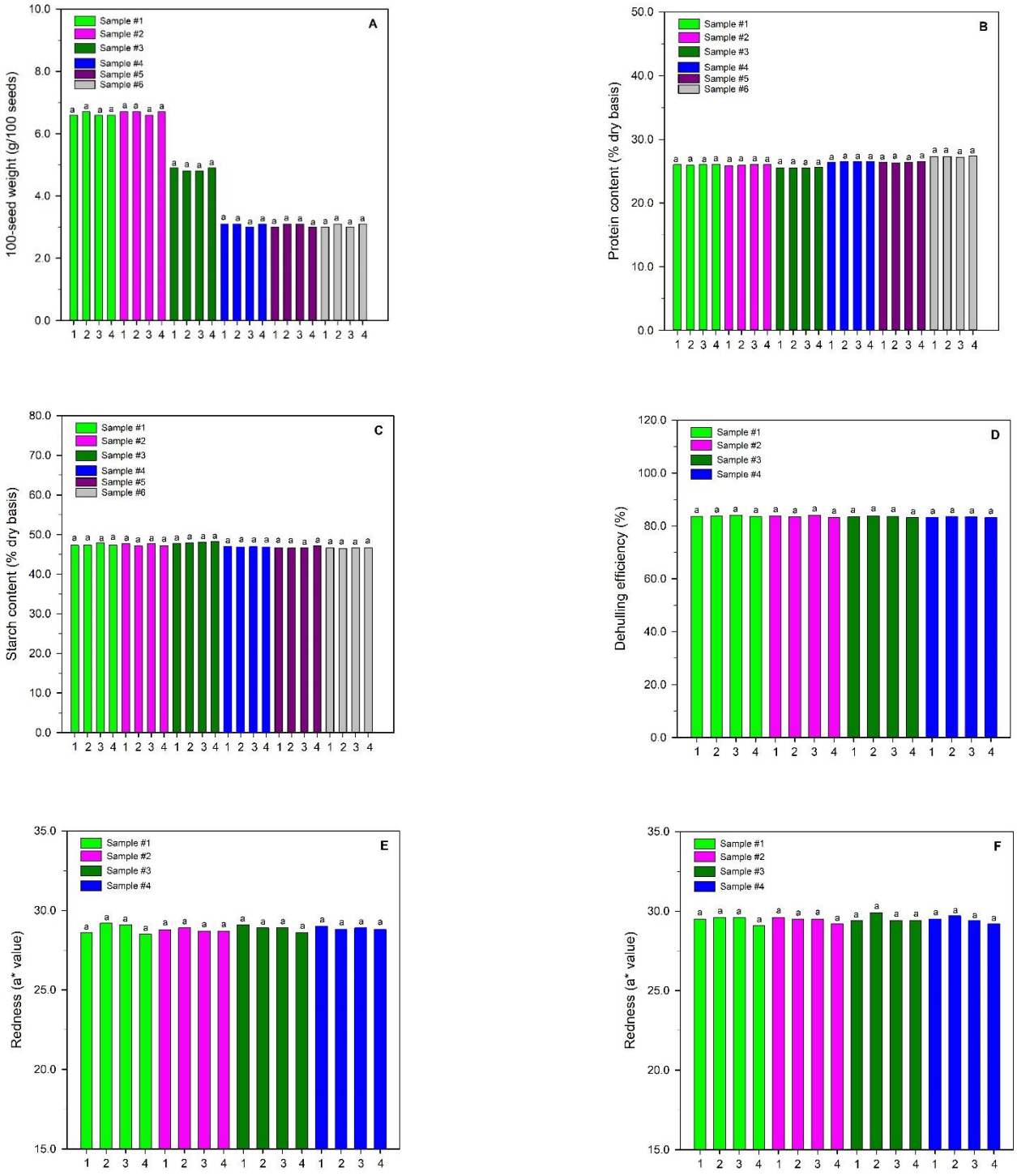

Figure 2 Effect of application of food grade mineral oil to lentil samples on (A) 100-seed weight, (B) protein, (C) starch content, (D) dehulling efficiency, (E) redness (a* value) of dehulled whole seeds and (F) redness of dehulled split seeds of red lentils X-axis: 1–0.0% mineral oil applied; 2–0.02% (w/w) applied; 3–0.04% (w/w) applied; and 4–0.06% (w/w) applied.

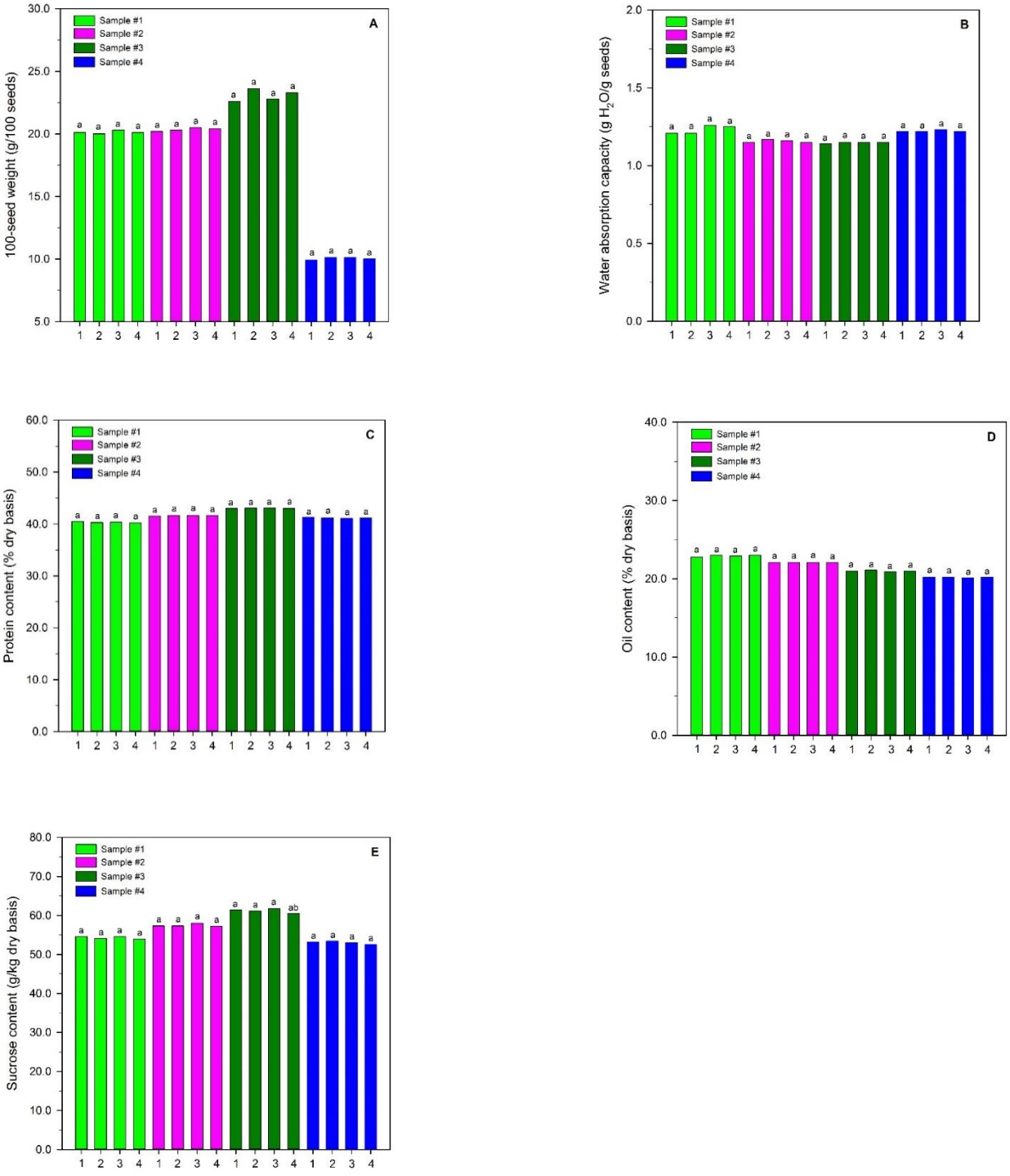

Figure 3 Effect of application of food grade mineral oil to food-type soybean samples on (A) 100-seed weight, (B) water absorption capacity, (C) protein, (D) oil and (E) sucrose content. X-axis: 1–0.0% mineral oil applied; 2–0.02% (w/w) applied; 3–0.04% (w/w) applied; and 4–0.06% (w/w) applied.