PRO1533: Characterization of Quality, Bioactive, and Anti-Nutritional Compounds of Saskatchewan-Grown Pulses Prepared With Various Cooking Conditions

Pulses are rich in nutrients such as non-gluten proteins, slowly digestible starch, dietary fibre, minerals, and vitamins. They also contain several bioactive compounds, such as polyphenols and carotenoids, and anti-nutritional compounds such as flatus oligo-sugars and enzyme inhibitors. Cooking in solutions having different heat transfer properties using various types of energy would influence water uptake and cooking quality of pulses. These factors would determine the extent of changes in seed components and removal of anti-nutritional compounds. The project was conducted to achieve the following objectives: 1. to evaluate quality of pulses in raw and processed form; 2. to identify optimal cooking conditions using four methods (traditional, pressure, slow, and microwave cooking) and four solutions (water, acid, sweet, and salt); 3. to investigate impact of cooking conditions on starch nutritional fractions (rapidly digestible starch (RDS), slowly digestible starch (SDS), and residual or resistant starch (RS); 4. to investigate effect of cooking conditions on anti-nutritional compounds (raffinose family oligosaccharides and trypsin inhibitor) to ensure tolerable levels of these compounds in cooked pulses; 5. to assess phenolic acid antioxidants in cooked pulses to predict their potential health effects; and 6. to determine if cooking in various solutions using different cooking methods would save the amount of energy required for optimal cooking quality.

Three Saskatchewan grown pulses (faba beans, lentils, and peas), four cultivars of each were investigated. Significant differences were found among cultivars within each pulse in terms of seed characteristics, nutrient content, cooking time and firmness of cooked pulses. Also, significant differences were observed among cultivars in hydration capacity and firmness. Pasting peak viscosity of pulse flours also showed significant differences among pulse crops and cultivars. Peak viscosity was in the order lentils > peas > faba beans. The flour viscosity method could hold a promise in testing early generations of pulses in breeding programs instead of the cooking method based on lower sample weight (4 g versus 40 g). Starch nutritional fractions (e.g. RDS, SDS, and RS) significantly varied among pulses with cooking methods having a considerable impact on starch digestibility. Slow cooking resulted in the lowest concentration of RDS, while SDS was very high and the residual starch was higher than that of the raw material. Slow cooking of faba beans, peas, and lentils in salt solution or water was more effective compared to the other methods in reducing flatus oligo-sugars and trypsin inhibitor without compromising quality of cooked pulses. Parboiling of pulses for 2 min prior to slow cooking as a pre-treatment resulted in improved quality of cooked pulses. This finding has not been reported before and would be used as a new approach in pulse processing. Phenolic acids and antioxidant properties were also different among pulses and influenced by cooking methods. In general, the results demonstrated that cooking conditions (cooking method and cooking solution) could significantly affect the nutritional quality of the cooked pulses to different extents.