

Cluster 2 – Progress Report for the Cluster 2 Science Advisory Body

1. CLUSTER PROJECT DETAILS

Project number: CL03-Pulse Activity T3.P22.V1

Name of Project: A quantitative assessment of the anti-nutritional properties of Canadian pulses

Project research period: 2015-04-01 to 2016-03-31

Period covered by this report: 2014-04-01 to 2017-03-31

Principal investigator and research collaborators: Mike Nickerson (PI), Susan Arntfield, Janitha Wanasundara

NON-CONFIDENTIAL ABSTRACT/SUMMARY

This project involves quantifying the levels of anti-nutritional compounds within a wide range of Canadian pulses and soybean (as a control) found as-is within the marketplace and after soaking/cooking using colourimetric and chromatographic assays. Work will be done through a collaborative research partnership between the University of Saskatchewan, University of Manitoba, and AAFC-Saskatoon. A variety of market classes including chickpeas, lentils, peas, faba beans, and beans were received from Alliance Grain Traders (AGT) and the Crop Development Centre at the University of Saskatchewan. These samples are processed to separate seed coat as one of the processing options. Then another set will be processed by soaking followed by boiling. For quantitation of selected anti-nutrients liquid chromatographic and colorimetric methods will be used. Colorimetric methods employed for pulses by other researchers will be evaluated and used for phytic acid, trypsin inhibitors, total tannins, and total phenolics contents. For saponins, oligosaccharides, and phenolic acid composition liquid chromatographic methods using HPLC. To date, levels of total phenolics, α -amylase inhibitor, trypsin inhibitor, lectins, and phytic acids have been assessed for both raw and cooked pulses. Results found that pulse type had a significant effect on levels of α -amylase inhibitor, trypsin inhibitor, lectins and phytic acid. Soybeans contained the highest contents of trypsin inhibitor (45.89 TIU/mg), lectins (692.82 HU/mg), and phytic acid (22.91 mg/g) among all seeds investigated. α -Amylase inhibitory activity was absent in peas, lentils, chickpeas, and faba beans, but was present in beans, where values ranged from 786– 1370 AIU/g. Trypsin inhibitor levels of raw peas, lentils, chickpeas, faba beans, and beans ranged from 3.16 – 20.8 TIU/mg, with the lowest values for peas and the highest for beans. Beans contained relatively high lectin levels followed by lentils, peas, faba beans, and chickpeas with very low values (2.73 – 2.74 HU/mg). Phytic acid was detected in all samples with the lowest levels in peas (8.55 – 12.40 mg/g) and the highest in faba beans (19.7 – 22.8 mg/g). Total phenolics we found to range between 4.4 to 5.1 mg/g for raw peas, 12.5 to 14.2 mg/g for raw lentils, 4.6 to 5.8 mg/g for raw chickpeas, 6.7-8.0 mg/g for raw pinto beans, 4.2-4.7 for Navy beans, 32.7 to 39 mg/g for faba beans, and 27.7-28.7 mg/g raw soybeans. Cooking of presoaked seeds was more effective; all proteinaceous anti nutrients (α -amylase inhibitor, trypsin inhibitor, and lectins) were reduced by 80-100%. Significant reductions in phytic acid content (11-39%) and total phenolics were also observed for all pulses. To summarize, the level of anti-nutritional factors in Canadian pulses varied widely, but levels were generally lower than those found in soybeans. Processing, specifically heat processing, significantly reduced these levels.