

THE EFFECT OF SOAKING AND COOKING ON THE OLIGOSACCHARIDE CONTENT OF RED KIDNEY BEANS (*PHASEOLUS VULGARIS L.*)

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Introduction

Legumes, especially beans are considered an important and inexpensive source of protein, dietary fiber, vitamins, essential minerals (Fe, Zn, Ca, etc) and bioactive compounds such as folates, saponins, and phenolics, in many developed and developing countries. In addition, beans are very low in sodium, cholesterol, and saturated fatty acids but rich in unsaturated fatty acids such as linoleic acid. Albeit beans are very important to human health, several factors distract from their full nutritional potential, such as the presence of antinutritional factors that cause flatulence. Oligosaccharides of the raffinose family (raffinose, stachyose, and verbascose) cannot be digested because of lack of α -1,6-galactosidase activity in the mammalian intestinal mucosa. These sugars are therefore fermented anaerobically by microorganisms on the wall of large intestines to produce carbon dioxide, hydrogen and methane gases. The major objective of this study was to evaluate the effect of soaking at different lengths of time and the effect of sugar-coating on the oligosaccharide contents in red kidney beans. Sugar-coating of beans was done to produce a potential value-added snack product.

Materials and Methods

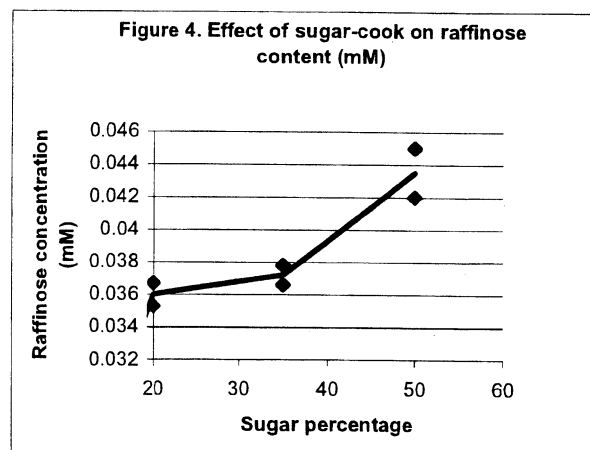
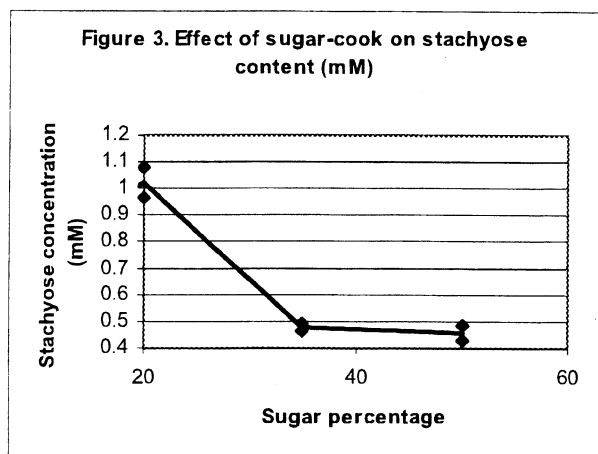
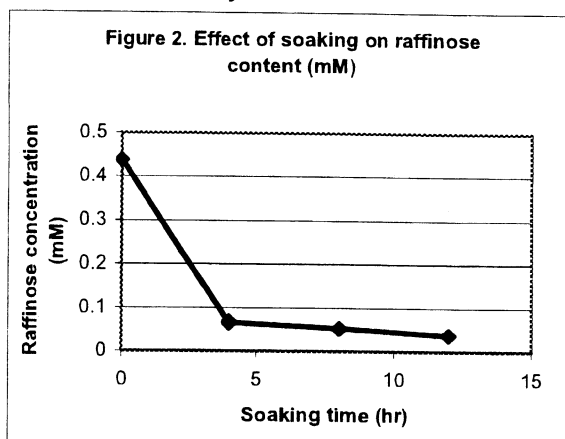
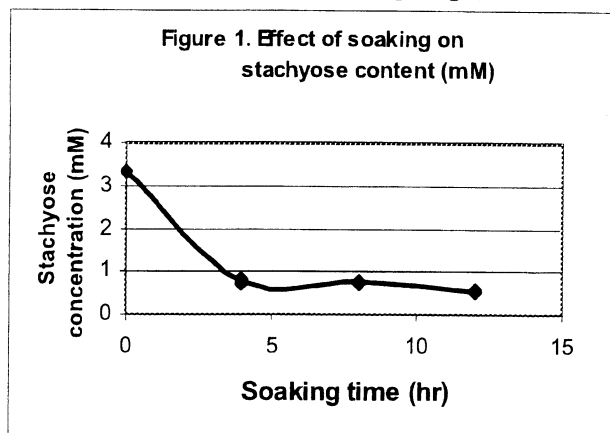
Dry red kidney beans (*Phaseolus vulgaris L*) used as research material were purchased from Bayside Best Beans, LLC (Sebewiang, MI). The damaged beans were segregated from the main population, and then raw bean material were mixed in duplicate with distilled water at 1:5 (w/v) at an initial temperature of 77°C containing approximately 0.08 and 0.06% of sodium carbonate and sodium polyphosphate respectively. Samples were collected after 4, 8, and 12 hours of soaking. After 12 hours soak, the beans were cooked in water for 14 minutes at 98°C containing 0.06 and 0.04% sodium bicarbonate and sodium polyphosphate respectively. Beans were further sugar-cooked in 20, 35 and 50% sugar/water solution at 70°C for 45 minutes. After, the samples were analyzed for raffinose and stachyose using High Performance Liquid Chromatography (HPLC). Analysis of variance was done using JMP IN 5.1 software to determine and compare the differences in stachyose and raffinose contents. Tukey-Kramer Honestly Significant Difference Test was performed for comparisons. Significant differences were established at $\alpha = 0.05$.

Results and Discussion

Bean soaking

Four hours of soaking resulted in greater than 76 and 84% of stachyose and raffinose reduction respectively ($\alpha = 0.05$, Figures 1 & 2). These results show that it may not be necessary for to

soak beans for 12 hours if the aim is to reduce flatulence-producing oligosaccharides. Complete removal of flatus-producing oligosaccharides is not advisable as they have health benefits.



Sugar-cook

The amount of stachyose decreased ($\alpha = 0.05$) with increase in sugar concentration (Figure 3). Conversely, raffinose concentration increased with increase ($\alpha = 0.05$, Figure 4) in sugar concentration. It is unclear why raffinose concentration increased slightly with increase in sugar concentration.

Acknowledgement

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References

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