ABSTRACT


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Diets high in dietary fiber could give a positive physiological effect but could also result in decreased bioavailability of nutritionally important minerals such as iron (Fe). Iron deficiency could lead to anemia, a condition detrimental to health. Iron binding by dietary fiber is affected by food processing, among others by boiling. The duration of boiling and acidity (pH) could influence the binding of minerals by dietary fiber. Yard-long bean (Vigna sesquipedalis (L) Fruhw) is a vegetable high in dietary fiber, commonly consumed either raw or after boiling.

The aim of the present study is to find the appropriate combination of acidity and length of boiling time as applied to yard-long bean to maintain adequate iron bioavailability and to determine the iron binding pattern by dietary fiber. For this purpose a combination of pH 4 and 7 with boiling time of 0 (raw), 5, 15 and 25 minutes are used.

The study was done in three stages, first to determine the content of dietary fiber, second to determine the iron binding pattern by determining the percent iron bound, $K_{eff}$ and $K_{ads}$, and third determining iron bioavailability using rats (Rattus norvegicus, Wistar strain) as an animal model measuring three variables: percent iron absorbed, hemoglobin regeneration efficiency (HRE) and relative biological value (RBV). When statistical analysis is needed, a 5% significance level ($\alpha = 5\%$) is used.

The result of the first stage study showed that decreasing pH and increasing boiling time has no effect on pectic substances, hemicellulose and lignin but an apparent increase in cellulose was observed, probably due to the formation of resistant starch which by the method used was measured as cellulose.

The second stage study showed that: first, two binding pattern were found, i.e. through adsorption and complex compound formation; second, decreasing pH and increasing boiling time decreases $K_{eff}$, $K_{ads}$ and percent iron bound; third, the decrease in bound iron is not due to decreasing dietary fiber components content but due to changes in the molecular structure of the fibers thus decreasing $K_{eff}$ and $K_{ads}$.

The third stage study showed that with boiling, increasing boiling time and lowering pH will increase iron bioavailability, while without boiling (raw condition) lowering pH will also result in increasing iron bioavailability.

The overall result from this study were: first, regarding the best condition to sustain iron bioavailability was in decreasing order: raw-pH 4; raw-pH 7; boiled: pH 4- boiling time at 25 minutes; second, regarding iron binding to dietary fiber present in yard-long bean, complex compound formation is more prominent than adsorption, the complex formation involving two specific binding sites, one of which showed a higher affinity than the other.

Key words: yard-long bean, dietary fiber, acidity (pH), boiling time, bioavailability.