

Cookability and nutritional properties of soaked, stored and roasted mucuna (*mucuna pruriens*) beans

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Date: 2010

Abstract:

Mucuna (*Mucuna pruriens*) is a legume with high potential as food and for soil fertility improvement. The seed has high potential to contribute protein in human diet. However, use of the seed as food is limited by the presence of several antinutrients notably the non-protein amino acid, 3, 4-dihydroxy-L-phenylalanine (L-Dopa) that can cause toxic effects in humans. *Mucuna* also possesses hard-to-cook property which increases with storage. This study was, therefore, designed to develop appropriate processing methods that sufficiently lower cooking time and the levels of L-Dopa to make *Mucuna* bean a safe and acceptable food. Three *Mucuna* bean varieties; the white, mottled and black seeded were used for the study. The bean was soaked whole, dehulled intact or dehulled split in distilled water, and solutions of citric acid, Magadi soda (trona) and maize cob ash of varying concentrations. The effects of the soaking treatments on cooking time and nutritional quality of the bean with emphasis on L-Dopa were assessed. The three varieties of beans were not significantly different in proximate composition. Crude protein ranged between 25.4% and 28.8%, crude fat between 2.91% and 5.5%, crude fibre between 7.9% and 10.8%, total ash between 3.1 % and 4.3% and soluble carbohydrates between 50.8% and 59.8%. All the varieties contained high levels of the minerals iron, magnesium, potassium and phosphate, moderate levels of calcium and sodium but low levels of copper, zinc and manganese. The content of L-Dopa ranged between 3.9% and 4.9% with the white variety having a significantly higher level than the other two varieties. The levels of trypsin inhibitors ranged between 14.8 TU/mg protein in the black variety to 27.7 TU/mg protein in the mottled variety, phytic acid between 0.3% in the mottled variety and 0.73% in the black variety, total phenolics between 0.18% and 0.23% and tannin content between 1.9 and 2.4%. Dehulling did not significantly affect the levels of L-Dopa content in all varieties. Dehulling reduced the cooking time from 18.6 hours, 15.5 hours and 16.4 hours to 6.5, 6.4, 6.2 hours for the white, mottled and black variety respectively. Cooking both whole and dehulled bean without prior soaking reduced the L-Dopa content to between 3.23% and 3.98% in all varieties. These levels were well above the recommended safe limit of 1.0% in the products. Soaking in acid and alkaline solutions reduced the cooking time better than soaking in water. Soaking in alkaline solutions (magadi soda, maize cob ash solutions) reduced the cooking times more than soaking in acid solutions. Soaking intact and dehulled split bean in 0.5% solution of citric acid and Magadi soda for 24 hrs and 12 hours, respectively before cooking reduced the L-Dopa to 0.67% (dry matter basis) in the cooked products, which was below the recommended safe level of 1.0%. Using similar concentrations soaking in maize cob ash extracts reduced the L-Dopa in the cooked products more than soaking in the magadi soda solutions. Roasting the intact raw bean to make a beverage after soaking in citric acid, Magadi soda and maize cob ash solutions reduced the level of L-Dopa 1.02 and 1.43% respectively. Although the bulk of this L-Dopa, moves into the infusion, the final levels in the beverage would be below the maximum allowed levels. In parallel with L-Dopa, the other anti-nutrients, notably, trypsin inhibitors were also significantly

reduced by soaking, with more reductions being recorded in products soaked in alkaline than acid solutions. Results indicate that soaking of the dehulled Mucuna bean products in acid and alkali solutions reduces the cooking time and makes the products safe to eat by reducing the levels of the toxic L-Dopa to below the maximum allowed limits. Soaking the intact bean in similar solutions improves the roasting characteristics and results in a beverage infusion with levels of L-DOPA below the maximum allowed limits. Use of the maize cob ash extract for soaking is recommended because it is readily available, being already prepared and used for cooking other foods in some communities.