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Effects of Processing *Mucuna* Bean (*Mucuna pruriens* L.) on Protein Quality and Anti-nutrients Content

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Abstract

Mucuna bean is grown in many parts of Kenya as a green manure/cover crop. The bean contains a high protein content but remains a minor food crop due to the presence of anti-nutrient compounds mainly 3,4-dihydroxy-L-phenylalanine (L-Dopa). The potential for utilisation of *mucuna* bean as an alternative source of protein was evaluated by assessing the effect of various processing methods on its protein quality and anti-nutrient compounds. *Mucuna* bean was processed to remove L-Dopa and other anti-nutrient compounds by different methods such as soaking, autoclaving, roasting, germination, and alkaline fermentation. Protein quality was determined by amino acid composition, *in vitro* and *in vivo* rat balance methodologies. All processing techniques, except roasting, reduced levels of L-dopa by >95% and other anti-nutrient compounds such as total phenols, trypsin inhibitor and phytates. Processing improved *in vitro* protein digestibility (IVPD) but significantly ($P < 0.05$) reduced protein content. Soaking in acidic medium (pH 3.2) at 60°C for 48 hrs significantly improved IVPD (80.5%) and biological value (80.8) of *mucuna* bean protein. The content of essential amino acids met the recommended FAO/WHO reference requirements for 2–5 yr old except for tryptophan. However, true digestibility for processed bean diet was poor (58%) and protein digestibility-corrected amino acid score (PDCAAS) low (0.4) compared to that of reference casein (1.0). This was attributed to both low sulphur amino acids content and residual anti-nutrient factors that affect protein hydrolysis such as phenolic compounds. *Mucuna* protein diet did not support growth of weanling rats indicating amino acids pattern incompatible with the needs of weanling rats. Histological examination of liver and kidney tissues revealed that consumption of processed *mucuna* bean as the only source of protein caused inflammation of the organs. This suggests possible presence of other toxins in processed bean even though *mucuna* bean diet contained the recommended safe level of residual L-Dopa (<0.1%). Processing *mucuna* bean improved the protein quality and reduced the content of anti-nutrient compounds. However, *mucuna* bean is not recommended as a sole protein in human diet.

Keywords: Anti-nutrient, L-Dopa, *mucuna* bean, processing, protein, quality