

ORIGINAL RESEARCH

Sprouting and hydrothermal treatments improve nutritional quality and consumer acceptability of biofortified common bean (*Phaseolus vulgaris*)

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Abstract

The nutritional quality and consumer acceptability of common beans could be significantly improved through the application of various processing methods, such as sprouting and hydrothermal treatments. Biofortification strategies to address micronutrient deficiencies applied to staple foods have become increasingly popular, most particularly with the common bean. However, information is scarce regarding the nutritional impact of combining sprouting and hydrothermal processing techniques on the Kenyan biofortified common bean Nyota variety. Therefore, this study sought to investigate the effect of combining sprouting and hydrothermal treatments: precooking, conventional cooking, pressure cooking (R-raw, RS-raw sprouted, SCC-sprouted and conventionally cooked, SPC-sprouted and pressure cooked, PCC-precooked and conventionally cooked, PPC-precooked and pressure cooked) on nutritional quality and consumer acceptability of biofortified common bean (*Phaseolus vulgaris*), Nyota variety. Proximate composition, iron and zinc content were analyzed using standard AOAC procedures. HPLC analysis was used to determine phytic acid and oligosaccharides content, while the vanillin-HCL method was used to analyze tannins. Affection sensory evaluation was done using a 7 hedonic scale ranking method with 1- extremely dislike and 7- extremely like for consumer acceptability evaluation. Statistical analysis was done using SPSS at a significance level of $p < 0.05$. The results showed that the iron and zinc concentrations for SCC, SPC, PCP, and PPC were significantly increased by more than 20% and 27%, respectively. Equally, anti-nutrients reduced significantly. Precisely, phytate content reduced by over 35%, tannins by up to 57%, and oligosaccharides i.e stachyose by over 82%, verbascose by 91% and raffinose by 76%. Lipids also reduced from 2.56 ± 0.09 (R) to 2.23 ± 0.27 (PPC). The phytate: iron molar ratio reduced significantly by up to 29% for PCC. The texture of the Nyota bean was improved by the sprouting and hydrothermal treatments with PPC scoring the highest at 6.1 ± 1.12 . On overall consumer acceptability, the PPC was the most desirable with an overall liking score of 6.03 ± 1.16 . These findings implied that sprouting and hydrothermal treatments improved the nutritional quality specifically the increase in the iron and zinc contents which are the target biofortification minerals. Additionally, the phytate, tannin and oligosaccharides content reduced translating to improved minerals bioavailability.

Keywords: Sprouting, Hydrothermal, Biofortified, Common bean, Anti-nutrients