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EDITED BY

Rakesh Bhardwaj,
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Wasiu Awoyale,
Kwara State University, Nigeria
Karl Kunert,
University of Pretoria, South Africa

*CORRESPONDENCE

Mary W. Muroki
✉ marywambuimuroki@gmail.com

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Cooking properties and nutrient retention of biofortified common bean (*Phaseolus vulgaris*) varieties: The case of Burundi

Mary W. Muroki^{1*}, Lydia M. Waswa², Robert Fungo^{3,4},
Andrew Kabwama⁵ and Symon M. Mahungu¹

¹Department of Dairy, Food Science and Technology, Egerton University, Nakuru, Kenya, ²Department of Human Nutrition, Egerton University, Nakuru, Kenya, ³Alliance of Bioversity International and International Centre for Tropical Agriculture (CIAT), Nairobi, Kenya, ⁴School of Food Technology, Nutrition, and Bio-Engineering, Makerere University, Kampala, Uganda, ⁵Alliance of Bioversity International and International Centre for Tropical Agricultural, Kampala, Uganda

Introduction: Current research on micronutrient deficiency indicates positive outcomes associated with utilizing biofortified beans in mitigating nutrition-related iron and zinc deficiencies, primarily in Sub-Saharan Africa. The common bean is however not palatable in its raw state and requires cooking before consumption. Existing research on the cooking qualities and nutrient retention of these novel biofortified common bean varieties is nonetheless scant, notably in Burundi.

Materials and methods: This study determined water absorption capacity, cooking yield, cooking time, and iron and zinc retention of 9 biofortified common bean varieties with Kinure, a traditional non-biofortified variety, as the control. The study employed a 10 × 2 completely randomized design in a factorial arrangement. The first factor was bean varieties with ten levels, and the second was pre-treatment with two levels, soaking and not soaking. Standard methods were used to analyze cooking properties and mineral retention, and experiments replicated thrice. Data analysis was conducted at a 95% confidence level and included Analysis of Variance and *t*-test comparison studies. *Post-hoc* analysis was performed using Tukey's Honestly Significant Difference.

Results and discussion: Cooking properties and mineral retention varied significantly between soaked and unsoaked bean varieties ($P < 0.05$) and in comparison, to Kinure ($P < 0.05$ and $P < 0.001$). Water absorption capacity varied from 64.51% to 116.3%. Soaked beans recorded half the total cooking time needed to cook unsoaked beans (77.62 versus 156.86 minutes), had higher cooking yields (289.77% versus 259.82%), and reduced Fe (121.58 versus 167.8%) and Zn (127.74% versus 145.15%) retention. Compared to Kinure, soaking resulted in longer cooking times, lower cooking yields in the biofortified common beans, and an insignificant effect on their zinc retention. A significant correlation between iron and zinc retention ($r = 0.445$), water absorption capacity and iron retention ($r = -0.0425$) and water absorption capacity and zinc retention ($r = -0.477$) were recorded. Three clusters were also observed; iron and zinc retention, cooking yields, and water absorption capacity, and cooking time. It was observed that, soaking common beans before cooking reduces cooking time and increases cooking yield in both biofortified and traditional common bean varieties. Moreover, biofortified common beans are a good source of iron and zinc and could considerably alleviate micronutrient deficiencies, particularly in developing countries.

KEYWORDS

biofortification, varieties, micronutrient deficiencies, common beans, cooking properties, nutrient retention