The effect of different processing methods on the nutritional composition, anti-nutritional factors and emulsifying property of inoculated and non-inoculated *Vigna subterranea* (Bambara groundnut)



Maria Kapembe[1*], Penny Hiwilepo-van Hal[1] , Victoria Jideani[2]

[1]Food Science and Systems, University of Namibia, Namibia

[2] Food Science and Technology, Cape Peninsula University of Technology

Abstract:

Statement of the Problem: *Vigna subterranea* (Bambara groundnut) is an underutilized legume termed as a "complete food". The legume provides an important source of crude protein (up to 24%), carbohydrates (up to 63%), fats (up to 6.5%) and a good balance of essential and non-essential amino acids especially lysine (2.9 – 6.8% dry basis) and methionine (1.3 – 1.8%). Potassium, magnesium, phosphorus, zinc, and iron are major minerals contained in large amounts in the legume. Despite the significant nutritional profile and numerous studies in other parts of Africa, there is no information in Namibia on the effects various processing methods have on the legume's nutritional and emulsifying properties. Although researchers have indicated that ANFs reduce due to processing, the consumption of BGN amongst Namibian children is discouraged due to lack of knowledge around the field. This study evaluated the effects of boiling and roasting on the nutritional composition, anti-nutritional factor (ANF) and emulsifying properties of inoculated and non-inoculated cream, brown and red Bambara groundnut cultivars that were grown in Namibia.

Methodology: The cultivars were roasted for 15, 30 and 45 minutes at a temperature of 140°C respectively and boiled for 30 minutes in solution of 0.5g/100mL of $NaHCO_3$, NaCl, and $MgSO_4$ respectively. The beans were blended to conduct analysis.

Results: The results show that the mineral composition (P, K, Mg, Na, Mn, Zn) of non-inoculated beans increased after roasting and boiling, while there was a decrease in the mineral composition of inoculated beans. The results also indicate that a longer roasting time increases the fat, protein and fiber content. The overall nutrient composition increased in beans boiled in NaCl and $MgSO_4$. Findings also indicate that roasting reduces ANF. Results indicate that inoculated beans subjected to boiling and roasting have the highest EA%.

Conclusion: Roasting is a recommended processing method for small scale and large scale manufacturers as it destroys ANFs and increases macronutrients composition. Additionally, boiling in NaCl is more advisable as it is cost effective alkaline salt.

Biography:

Maria Kapembe is B.SC Honors graduate in Food Science & Technology from the University of Namibia. She is currently a postgraduate student pursuing her masters in Food Science & Technology where she is specializing in leguminous crops. Her research focuses on exploring the different effects of processing methods on the nutritional component of legumes grown in Namibia. She has a vast background in FMCG, beverage and dairy industry. In 2021, she served as an assistant on the United Nation Food System Summit which aimed at outlining opportunities and gaps within the agricultural sector to curb food insecuirty.

About Research Topic

Food security may be enhanced by increasing production and processing of underutilized crops. *Vigna subterranea* (Bambara groundnut) is one of the underutilized leguminous crops grown across the northern parts of Namibia. Currently there exists very limited information in Namibia on the botanical features of the Bambara groundnut cultivars and as a result the seeds are classified according to coat color. The University of Namibia in conjunction with the Namibia University of Science & Technology and University of Bremen with funding from DAAD undertook a conjoined study to study the effects that locally grown Bambara groundnuts would respond to processing.

About Institution:

The University of Namibia located in Windhoek, Namibia, is an institution of higher learning that focuses on various disciplines. The department of Food Science & Systems under the Faculty of Agriculture, Engineering & Natural Sciences envisions to provide skills for the increased food production, industrialization and product development in Namibia. The research topics within the faculty focus on various topics with a recent interest in studying Namibia's locally available biological plants and animals. The University of Namibia recognises and values the importance of research in the creation and dissemination of new knowledge and fostering socioeconomic development by addressing challenges faced by society.

References:

1. Adeleke, O. R., Adiamo, O. Q., & Fawale, O. S. (2018). Nutritional, physicochemical, and functional properties of protein concentrate and isolate of newly‐developed Bambara groundnut (Vigna subterrenea L.) cultivars. Food science & nutrition, 6(1), 229-242.
2. Bjornlund, V., Bjornlund, H., & Van Rooyen, A. F. (2020). Why agricultural production in sub-Saharan Africa remains low compared to the rest of the world–a historical perspective. International Journal of Water Resources Development, 36(sup1), S20-S53.
3. Carbas, B., Machado, N., Oppolzer, D., Ferreira, L., Queiroz, M., Brites, C., & Barros, A. I. (2020). Nutrients, antinutrients, phenolic composition, and antioxidant activity of common bean cultivars and their potential for food applications. Antioxidants, 9(2), 186.
4. Ajilogba, C. F., Olanrewaju, O. S., & Babalola, O. O. (2022). Improving Bambara Groundnut Production: Insight Into the Role of Omics and Beneficial Bacteria. Frontiers in Plant Science, 13.
5. Ouoba, A., Nandkangre, H., Palanga, E., Ouedraogo, T., Ouedraogo, M., & Sawadogo, M. (2019). Assessment of bambara groundnut landraces for resistance to Cowpea aphid borne mosaic virus. International Journal of Biological and Chemical Sciences, 13(6), 2704-2713.
6. improve its role in providing food security. Food Reviews International, 33(2), 167-194.
7. Mukakalisa, C. (2010). Molecular, environmental and nutritional evaluation of bambara groundnut (Vigna subterranea (L) Verdc.) for food production in Namibia (Doctoral dissertation).
8. Nwadi, O. M. M., Uchegbu, N., & Okonkwo, T. M. (2019). Effect of processing methods on the anti-nutrient reduction of Bambara groundnut: A review. Sky Journal of Food Science, 7(3), 037-041.

9. Lin Tan, X., Azam-Ali, S., Goh, E. V., Mustafa, M. A., Chai, H. H., Kuan Ho, W., ... & Massawe, F. (2020). Bambara groundnut: An underutilized leguminous crop for global food security and nutrition. Frontiers in Nutrition, 7, 276.