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Coastal Indigenous Legume Varieties as Alternative Protein Sources: An Agroecological and Product Development Perspective in South Africa

Xolile Mkhize

Mangosuthu University of Technology, South Africa

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Abstract

South Africa's plant-based protein market remains limited, with commercially produced legumes grown through conventional agriculture. Retail markets often sell commercially processed legumes, such as canned sugar beans, which are widely consumed due to their affordability and convenience. In contrast, indigenous legumes (IL) cultivated across the South Coast of KwaZulu-Natal, despite their significant nutritional potential, remain underutilised within formal food systems and product development. Limited post-harvest processing and market access increase their vulnerability to spoilage and post-harvest losses. This study aims to explore agroecologically grown indigenous legumes as viable alternative protein sources and to propose canned product applications aligned with existing consumer preferences. A comparative nutrient profile analysis was conducted on three locally sourced indigenous coastal legume varieties, IL-NG1, IL-MZ1 and IL-IN1, against locally commercial retail legume (LCRL) varieties. Legumes were collected from local producers in the local market and analysed for Protein: AM03 [Buchi app. Note no. 3xxOO1en], Dietary fibre: AM09 [AOAC 991.43] and Minerals: Iron (Fe) and Magnesium (Mg) [NMKL 186: ICP-MS]. All macro- and micronutrient values for IL-NG1, IL-MZ1, and IL-IN1 were analysed using one-way ANOVA to test for significant differences between indigenous coastal and LCRL varieties. Where significance was detected, Tukey's post-hoc test identified specific pairwise differences. A significance level of $p < 0.05$ was applied, with $p < 0.001$ considered highly significant. The analysis included key nutrients such as protein, dietary fibre, iron, and magnesium to compare the nutritional profiles across varieties. IL-IN1 recorded the highest magnesium concentrations, 159.4 mg± 20.7 mg and dietary fibre 52.1 g/100 g. IL-NG1 recorded a protein content of 20.1 g /100 g, and with a second-highest fibre content of 44.0 g/100 g, reflecting a strong macro- and micronutrient profile that exceeds most commercially available canned alternatives. IL-NG1 and IL-MZ1 varieties demonstrated significantly higher iron content ($p < 0.001$). These findings contribute to addressing nutritional challenges and strengthening sustainable food systems through the utilisation of indigenous rural legumes, agroecological practices, and alternative protein sources. Therefore, integrating these varieties into formal canned product applications presents a scalable pathway to reducing post-harvest losses while diversifying South Africa's plant-based protein supply.

Keywords: Indigenous legumes, Alternative proteins, Agroecology, Post-harvest losses, KwaZulu-Natal