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Effect of soybean flour on nutritional, physicochemical, sensory characteristics and acceptance of soybean fortified wheat bread

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Soybean Introduction and Utilization Technologies to Enhance Nutrition and Income Generation in Lesotho.











Background

Bread is a staple food for Basotho and plays a central role in their diet. It is prepared using a simple formula consisting of flour, starter, salt, and water.

Historical records indicate that traditional Basotho bread was consumed as early as 1939, solidifying its place as a staple food in Lesotho



Basotho highly value bread for its taste and texture, often perceiving it as the most important cereal product (Nkhabutlane et al., 2019a).

(STC)







Problem statement

The traditional bread prepared from wheat flour is deficient in some amino acids and overdependency on this product as practiced by Basotho may lead to high prevalence of malnutrition-related health conditions.

Lesotho, like all developing countries is confronted with a serious problem of malnutrition and high levels of stunting and obesity due to lack of sufficient animal protein and inadequate dietary micronutrient intake.

Malnutrition in Lesotho, remains a critical factor in newborn and child mortality, with a 34% stunting rate

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Soybean

The soybean offers unique promise as a source of both protein and fats for human nutrition.

Its dry seed contains the highest Protein (40 -55%), Oil content (20 – 34%) Fibre (20 -24%) among grain legumes (Funduluka, et al., 2023).

Soybean flour has huge potentials of being used to enrich foods in order to provide adequate nutrients for individuals not meeting daily needs (Adelakun, O.E., 2013 et al).











Objectives

To determine the nutritional value of wheat bread fortified with Soybean flour.

- 2. To determine the physical characteristics of wheat bread fortified with Soybean flour.
- 3. To evaluate the sensory parameters
- that are important in determining consumption of wheat bread fortified with soybean flour using a group of farmers who are experienced in eating wheat bread















Methodology – Sensory Evaluation

Focus Group Method

Although the established quantitative methods do a great job of identifying statistical trends in consumer response, they do not always capture the internal dialogue of consumers as it relates to decisions, acceptance, attitudes, beliefs, behaviors, and even preferences of a new product (Drake et al., 2023, Rizzo et al., 2020).

• Focus group discussions were used to test acceptance and to generate consumer-oriented terms to describe the sensory attributes of Soybean flour fortified breads.

District	Location	Number of	
		participants	
Butha-Buthe	Ngoajane	7	
Leribe	Ha-Litsoako	7	
	Mpharane	12	
	Mahobong	16	
Quthing – Ha Makoae	Ha-Pokisi	11	
	Ha-Makoe		
	Ha-Masiu		
Maqokho	Ha-Tlatlametsi	14	
Mohales'Hoek	Mpharane	10	
Mafeteng	Ha-Mosala	15	
Total		92	

Table 1.The location and number of participants in each focus group









Results – Physical

 Table 2.
 Effect of soybean flour on the physical characteristics of dough and bread qualities

	Measurements							P				
	Samples	Dough weight before fermentation (g)	Dough weight after fermentation (g)	Baked Loaf weight (g)	Loaf height (cm)	Loaf volume (ml)	Specific Ioaf volume (ml)	Weight loss (g)	Weight loss %	Dough Yield (%)	Ratio v/w	
)	Control Wheat bread 400g	680	690	655	9.5	1600	2.4	35	5	172.3	2.44	
	Wheat bread with 10% soy flour (360 + 40)	650	650	610	9.1	1500	2.5	40	6.15	162.5	2.45	
	Wheat bread with 25% soy flour (300 + 100)	660	665	640	7.2	1000	1.5	25	3.75	166.5	1.56	











Results – Nutritional Value

 Table 3.
 Effect of soybean flour on the physical characteristics of dough and bread qualities

	Samples	Moisture %	Fat %	Protein %	Fibre %	Ash %	Carbohydrates%	Energy value
								(kca/j)
	Control Wheat bread 400g	8.10 ±0.21 ^a	5.20±0.52 ^a	8.5±0.56 ^a	3.03±0.32 ª	2.86±0.06 ª	72.3±0.34 ^a	386.5±0.04 ^a
3	Wheat bread with 10% soy flour (360 + 40)	8.57±0.16 ^b	8.06±0.43 ^b	13.5±0.61 ^b	4.17±0.75 ^b	3.12±0.08 ^b	62.3±0.34 ^b	402.9±0.06 ^b
	Wheat bread with 25% soy flour (300 + 100)	7.98±1.01°	9.53±1.13 °	19.33±1.39 °	3.86±0.39 ^b	3.54±0.44°	55.8±1.65 ^b	435.74±0.05°
	Soybean flour	10.91 ± 0.32 d	14.71 ±0.31 ^d	43.34 ±1.12 ^d	8.42 ±0.43 °	7.13 ±0.45 ^d	15.49 ±1.65 °	510.86±0.16 ^d
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Results – Sensory Analysis Attributes generated for Soyflour fortified bread by focus groups

Table 4.

Attributes Appearance

Colour

Aroma

Flavor/Taste

Soy Flour fortified bread Rough Crumb – small uniform air cells Crust nearly burned Crumb - Dense Yellowish brown crumb (mustard)

Milky Roasted cereal flavor Baked bread flavor Soybean aroma Peanut butter aroma Roasted flavor Beany after taste Milky Buttery Oily Sweeter than wheat bread Little salt



Texture

Fibrish Dense/compact Heavy Mouth feel Cohesiveness











Conclusion & Reccommendation

The findings of this study demonstrate that soybean flour supplementation significantly enhances the nutritional value of wheat bread by increasing protein and fat content while modifying sensory characteristics.

- Higher substitution levels led to reduced loaf volume and a denser crumb texture,
- Consumer acceptance remained high, with many participants favoring the unique taste and aroma of the fortified bread.
- Future research should explore additional fortification of more levels and processing methods to optimize bread quality and further minimize beany flavor.



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Did you know? Soybean is a miracle bean

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