

LENTIL (*LENS CULINARIS L.*) INTRASPECIFIC NUTRITIONAL VARIABILITY AND DEVELOPMENT OF A LENTIL-BASED SNACK

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OVERVIEW

Four lentil varieties with different seed coat colors underwent an in-depth nutritional analysis to determine which one is most suitable for the study in terms of future applicability. The results show that lentils are a good source of minerals, protein, phenolic content, and antioxidant activity and it is possible to partially substitute oatmeal flour with lentil flour in a snack.

INTRODUCTION

Lentils provide essential nutrients that contribute to human health. Besides, their low glycemic index helps avoid peaks in blood glucose, improving metabolic control. Although, their consumption in Portugal is lower than desirable. This project aims to identify the best-suited lentil to develop a lentil-based snack to be used in a human intervention trial, while at the same time promote lentil consumption.

METHODS

- *Lens culinaris L.* varieties: Kermit, Brown, Green, and Red;
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- Evaluation of lentil mineral profile by (ICP-OES) with radial configuration [1];
 - Assessment of protein percentage using the Dumas Nitrogen Analyzer;
 - Determination of total phenolic content by Folin-Ciocalteu [2] and antioxidant activity by ABTS [3];
 - Development of a lentil-based snack and evaluation of its nutritional value;
 - Statistical analysis: mean comparisons were performed by ANOVA on GraphPad software.

RESULTS

Table 1 – Mineral concentration of *Lens culinaris L.* varieties. Each value represents the mean \pm SEM. Different letters indicate significant differences ($p < 0.05$).

	Kermit	Brown	Green	Red
Potassium (K) mg.g ⁻¹	10.52 \pm 0.04 ^{ab}	9.44 \pm 0.02 ^b	11.92 \pm 0.41 ^a	11.94 \pm 0.02 ^a
Phosphorus (P) mg.g ⁻¹	3.89 \pm 0.04	4.71 \pm 0.03	5.78 \pm 0.13	5.56 \pm 0.08
Magnesium (Mg) mg.g ⁻¹	1.35 \pm 0.03	1.31 \pm 0.02	1.51 \pm 0.06	1.10 \pm 0.03
Calcium (Ca) mg.g ⁻¹	0.70 \pm 0.01	0.93 \pm 0.01	0.80 \pm 0.02	0.35 \pm 0.00
Iron (Fe) μ g.g ⁻¹	82.96 \pm 1.64 ^b	100.91 \pm 2.01 ^a	102.22 \pm 2.06 ^a	75.19 \pm 0.98 ^c
Zinc (Zn) μ g.g ⁻¹	43.42 \pm 0.12 ^d	64.99 \pm 0.14 ^a	52.03 \pm 0.78 ^c	60.63 \pm 0.88 ^b
Manganese (Mn) μ g.g ⁻¹	12.12 \pm 0.17 ^b	16.87 \pm 0.12 ^a	17.15 \pm 0.28 ^a	15.11 \pm 0.11 ^a

Kermit was the variety with the highest content of total phenolics and antioxidant activity, while Red lentil had the lowest; Brown and Green lentils had similar results.

TOTAL PHENOLIC CONTENT AND ANTIOXIDANT ACTIVITY

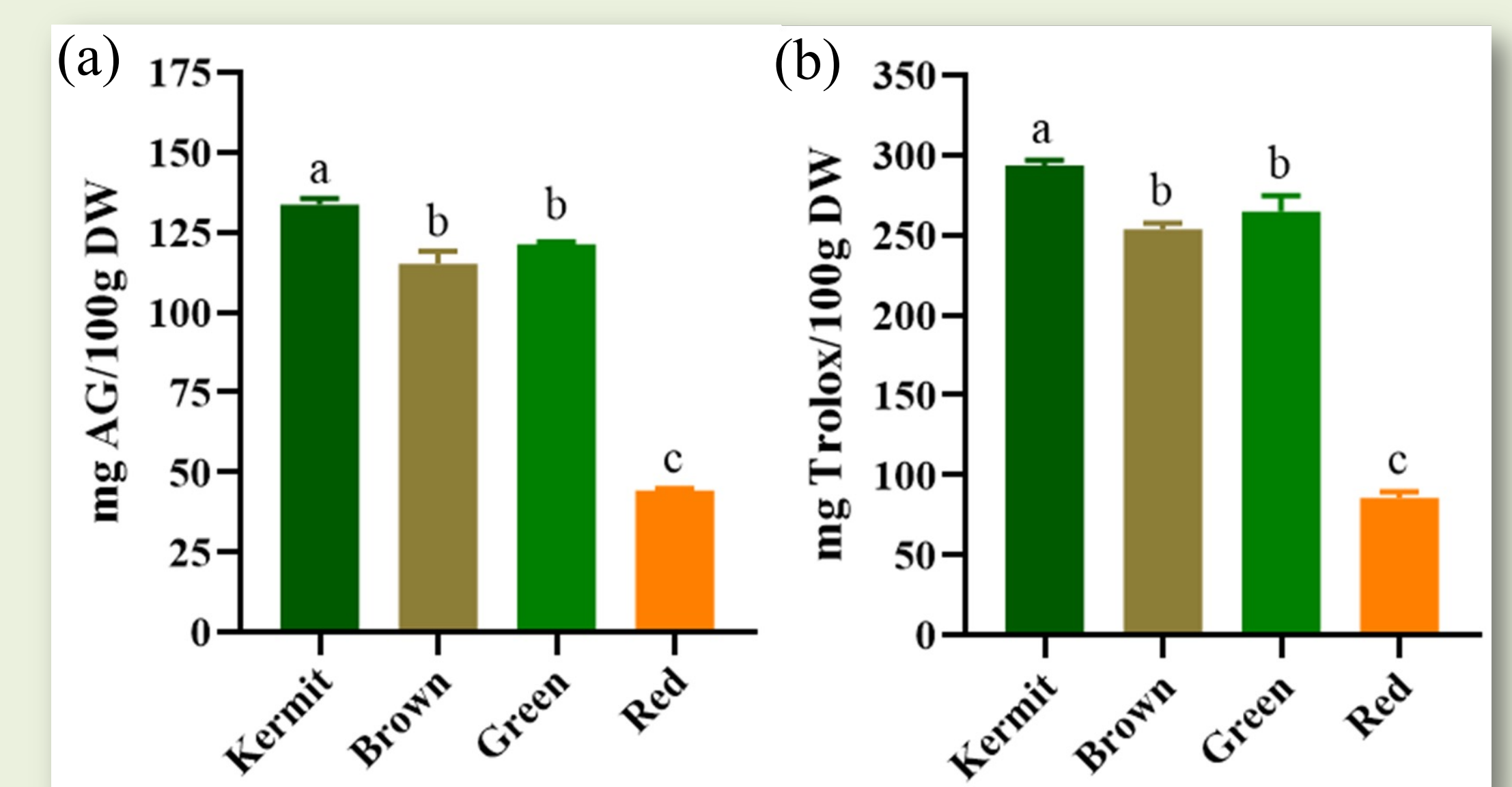


Figure 2 – Total phenolic content (a) and antioxidant activity (b) of *Lens culinaris L.* varieties. Each value represents mean \pm SEM in (a) mg of gallic acid equivalent or (b) mg of Trolox equivalent per 100 g of dry extract (DW). Different letters indicate significant differences ($p < 0.05$).

MINERAL PROFILE

No significant differences were observed for P, Mg, and Ca, while K was significantly higher in Green and Red lentils. In terms of micronutrients, Green lentil had the highest concentration of Fe and Mn, while Brown was the one with the highest Zn.

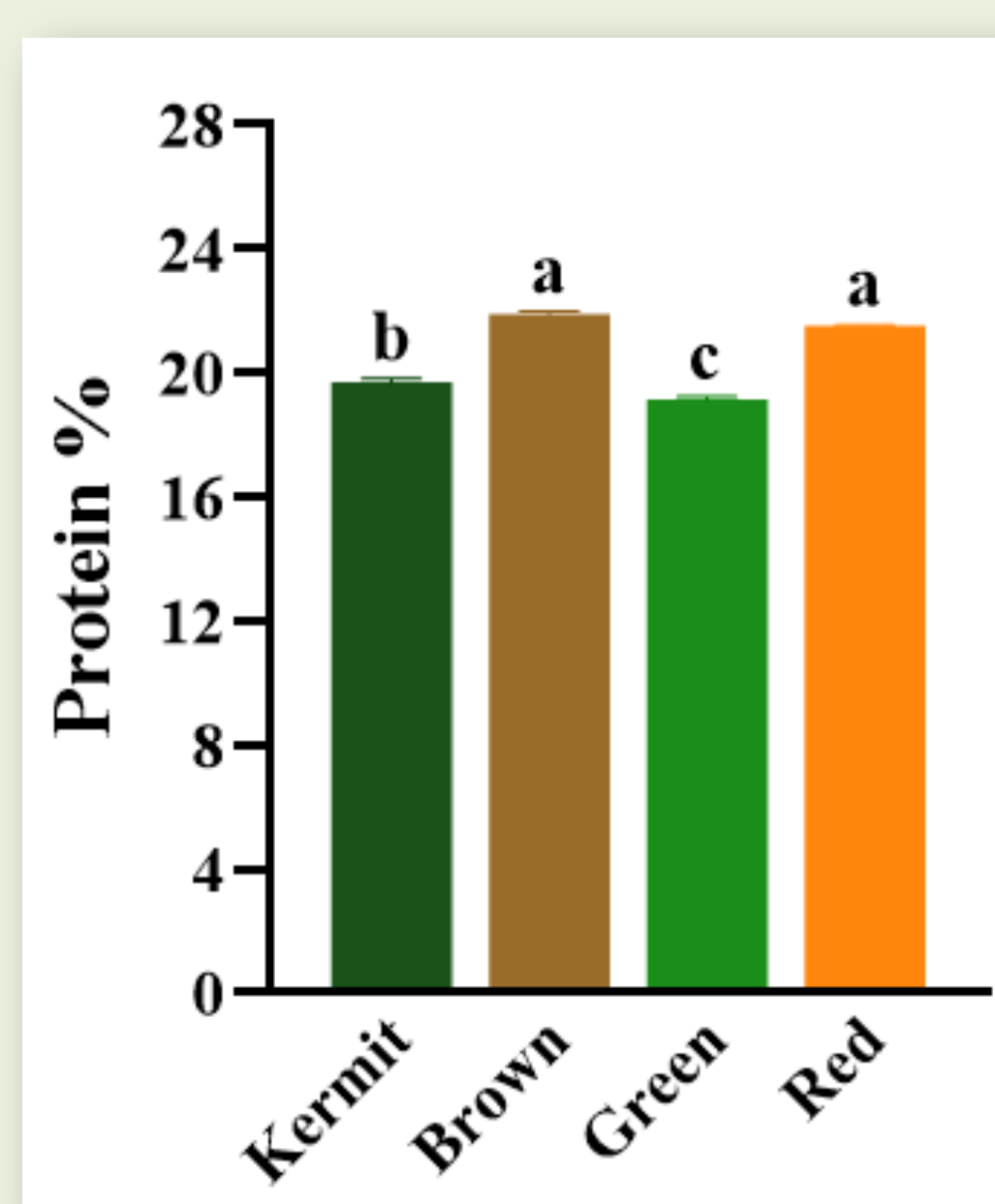


Figure 1 – Percentage of protein of *Lens culinaris L.* varieties. Each value represents the mean \pm SEM. Different letters indicate significant differences ($p < 0.05$).

PROTEIN LEVEL

Brown and Red lentils had about 10% more protein, although all varieties presented values between 19-22%.



Muffins made with 50 % lentil/oatmeal flour (left) and 100% oatmeal flour (right).

Nutritional composition	Lentil/oatmeal flour muffin	Oatmeal flour muffin
Energy (kcal)	231	275
Total fat (g)	5.1	6.4
Carbohydrates (g)	41.2	51.4
Protein (g)	8.1	5.5
Fibre (g)	5.8	5.0

Table 2 – Nutritional composition of 100 g of lentil/oatmeal flour and oatmeal flour muffins.

LENTIL-BASED SNACK

There are expected differences regarding the muffins nutritional value depending on the lentil variety used. Therefore, we used Kermit, with the highest phenolic content and antioxidant activity, since it is intended to evaluate, in a human intervention trial, its impact on cardiovascular risk factors.

CONCLUSIONS & FUTURE PERSPECTIVES

- Considering the nutritional profile of the lentil varieties, it is possible to choose the one with better quality for new food product development.
- In a way to incorporate lentil qualities into the human diet, we developed a snack in which commercial oatmeal flour was partially substituted with lentil flour.
- Soon, it is intended to test the lentil-based snack acceptability and determine its glycemic index.

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