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### THE FUTURE OF SUSTAINABLE FOOD: EXPLOITING THE NUTRITIVE POTENTIAL OF WILD PLANTS

Mihaela Lăcătuș<sup>1</sup>, Patricia Tarkanyi<sup>1</sup>\*, Monica Dragomirescu<sup>2</sup>, Aurica Breica- Boroza<sup>3</sup>, Mariana-Atena Poiană<sup>1</sup>, Diana Moigradean<sup>1</sup>, Simion Alda<sup>3</sup>, Despina-Maria Bordean<sup>1</sup>

<sup>1</sup>Faculty of Food Engineering, University of Life Sciences "King Michael I" from Timisoara, Aradului Street no. 119, 300645 Timisoara, Romania

<sup>2</sup>Faculty of Bioengineering of Animal Resources, University of Life Sciences "King Michael I" from Timisoara, Aradului Street no. 119, 300645 Timisoara, Romania

<sup>3</sup>Faculty of Engineering and Applied Technologies, University of Life Sciences "King Michael I" from Timisoara, Romania

\*Corresponding author: [PATRICIA-CRISTINA.TARKANYI.FIA@usvt.ro](mailto:PATRICIA-CRISTINA.TARKANYI.FIA@usvt.ro)

**Abstract:** In a context where food security and sustainability are becoming progressively important, edible wild plants offer valuable nutritional choices. *Chenopodium album*, also known traditionally as lambsquarter or bathua, is often ignored because is a wild specie but it can play a significant role in both nutrition and soil regeneration. *Chenopodium album* contains a diverse array of essential nutrients, including proteins, dietary fiber, vitamins, and minerals, rendering it a valuable nutritional resource. In addition to its nutrient profile, the presence of bioactive compounds endows the plant with significant antioxidant and anti-inflammatory properties. Furthermore, its cultivation contributes to environmental sustainability by enhancing soil fertility and reducing the risk of soil erosion In food industry, *Chenopodium album* has a special importance due to its high nutritional content. The plant is rich in proteins, fibers, vitamins (A, C, K) and minerals (calcium, iron, magnesium). The leaves can be used as an alternative to spinach; the seeds can be grounded and use in bakery products or alternatives in gluten-free products. Also, the plant is appreciated for its use in functional foods and gluten-free products. This study aims to explore the nutritional and ecological benefits of *Chenopodium album*. Bringing wild plants back into our diets can help create more diverse and sustainable food systems. By taking a fresh look at underused natural resources, the research highlights the potential of *Chenopodium album* as a practical, sustainable option for addressing some of today's challenges in food and agriculture.

**Keywords:** *Chenopodium album*, health benefits, sustainability, unutilized plants

## Introduction

The aim of the study is to promote the smart integration of wild plants, like *Chenopodium album*, into the daily diet. These underutilized species offer significant health benefits and can support sustainable, resilient food systems, especially in the context of environmental challenges and food insecurity.

- Chenopodium album* (lambsquarters) is a highly adaptable wild plant, rich in essential nutrients including vitamins A and C, minerals, proteins, omega-3 fatty acids and dietary fiber.
- The plant exhibits various medicinal properties: antioxidants, anti-inflammatory, antimicrobial and anticancer, supported by its content of flavonoids, polyphenols, saponins and phenolic acids.
- It thrives in a wide range of environmental conditions, including high salinity soils, making it a potential crop for sustainable agriculture in degraded or marginal lands.
- The seeds are a good protein source, suitable for people with gluten intolerance and offer a balanced amino acid profile.
- Despite containing antinutritional factors (oxalates, saponins, phytates) these can be reduced through heat processing (boiling or drying).
- Its low cost of cultivation, wide availability and ecological resilience make it an ideal candidate for inclusion in functional foods and climate-resilient food systems.
- Promoting the dietary use of *Chenopodium album* contributes to human health, supports biodiversity and addresses food insecurity.

## Material and method

Over 100 online resources and scientific studies from multiple research fields such as food chemistry, medicine, horticulture and agriculture – including databases like USDA, FoodB - were thoroughly reviewed to support the development of the study. The objective was to conduct a concise evaluation of the nutritional and environmental significance of *Chenopodium album*. The analyzed data is incorporated in the form of text, tables and references. All data were analyzed using PAST program, version 3.2 [31] and MVSP software, version 3.22.

## Results and discussions

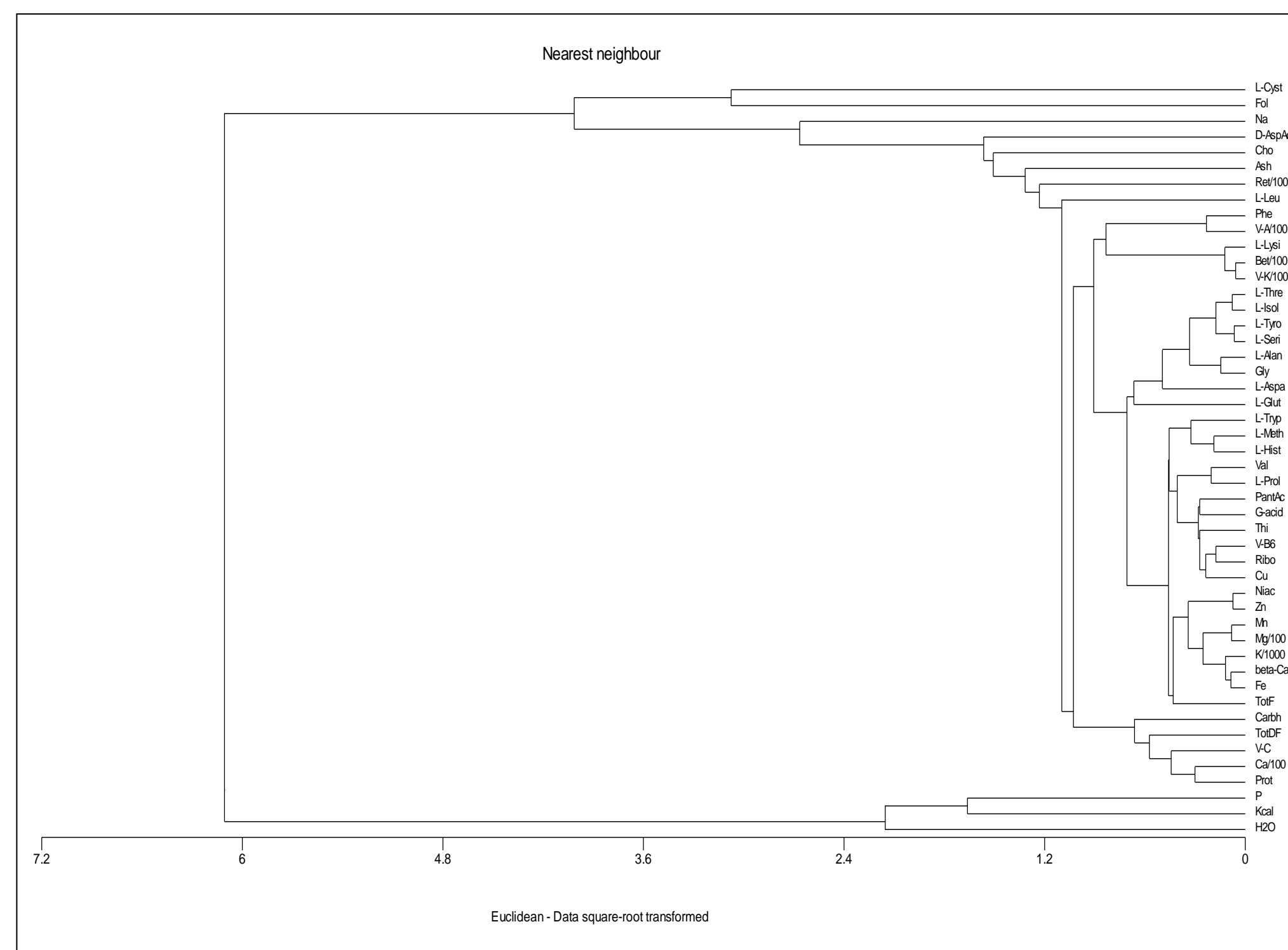


Figure 1. Relationships analysis between nutritional compounds in *Chenopodium album*

Legend: L-Cyst = L-Cysteine; Fol = Folate; Na = Sodium; D-AspAc = D-Aspartic acid; Cho = Choline; Ash = Ash; Ret = Retinol; L-Leu = L-Leucine; Phe = (±) Phenylalanine; V-A = Vitamin A; L-Lys = L-Lysine; Bet = Betaine; V-K = Vitamin K; L-Thre = L-Threonine; L-Isol = L-Isoleucine; L-Tyro = L-Tyrosine; L-Seri = L-Serine; L-Alan = L-Alanine; Gly = Glycine; L-Aspa = L-Aspartic acid; L-Glut = L-Glutamic acid; L-Tryp = L-Tryptophan; L-Meth = L-Methionine; L-Hist = L-Histidine; Val = (±) Valine; L-Prol = L-Proline; PantAc = Pantothenic acid; G-acid = Glutamic acid; Thi = Thiamin; V-B6 = Vitamin B-6; Ribo = Riboflavin; Cu = Copper; Niac = Niacin; Zn = Zinc; Mn = Manganese; Mg = Magnesium; K = Potassium; beta-Car = beta-Carotene; Fe = Iron; TotF = Total fat lipid; Carbh = Carbohydrate; TotDF = Total dietary fiber; V-C = Vitamin C; Ca = Calcium; Prot = Protein; P = Phosphorus; Kcal = Energy; H2O = Water.

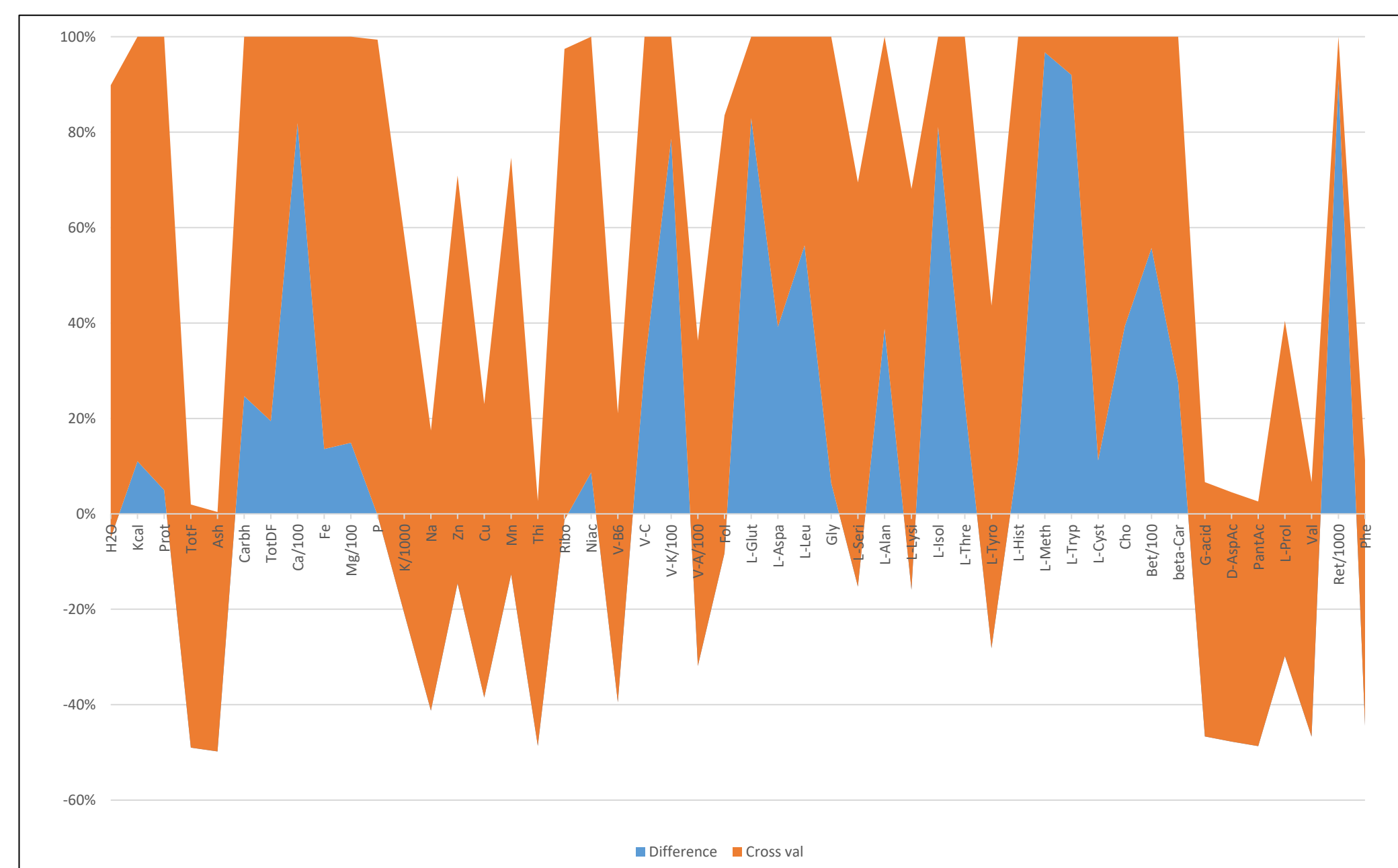


Figure 2. Cross validation based on Spatial Interpolation Kriging in nutritional compounds from *Chenopodium album*  
Legend: H2O= Water; Prot = Protein; Ash = Ash; TotDF = Total dietary fiber; Fe = Iron; P = Phosphorus; Na = Sodium; Cu = Copper; Thi = Thiamin; Niac = Niacin; V-C = Vitamin C; V-A = Vitamin A; L-Glu = L-Glutamic acid; L-Leu = L-Leucine; L-Seri = L-Serine; L-Lys = L-Lysine; L-Thre = L-Threonine; ; L-His = L-Histidine; L-Tryp = L-Tryptophan; Cho = Choline; beta-Car = beta-Carotene; D-AspAc = D-Aspartic acid; L-Prol = L-Proline; Ret = Retinol.

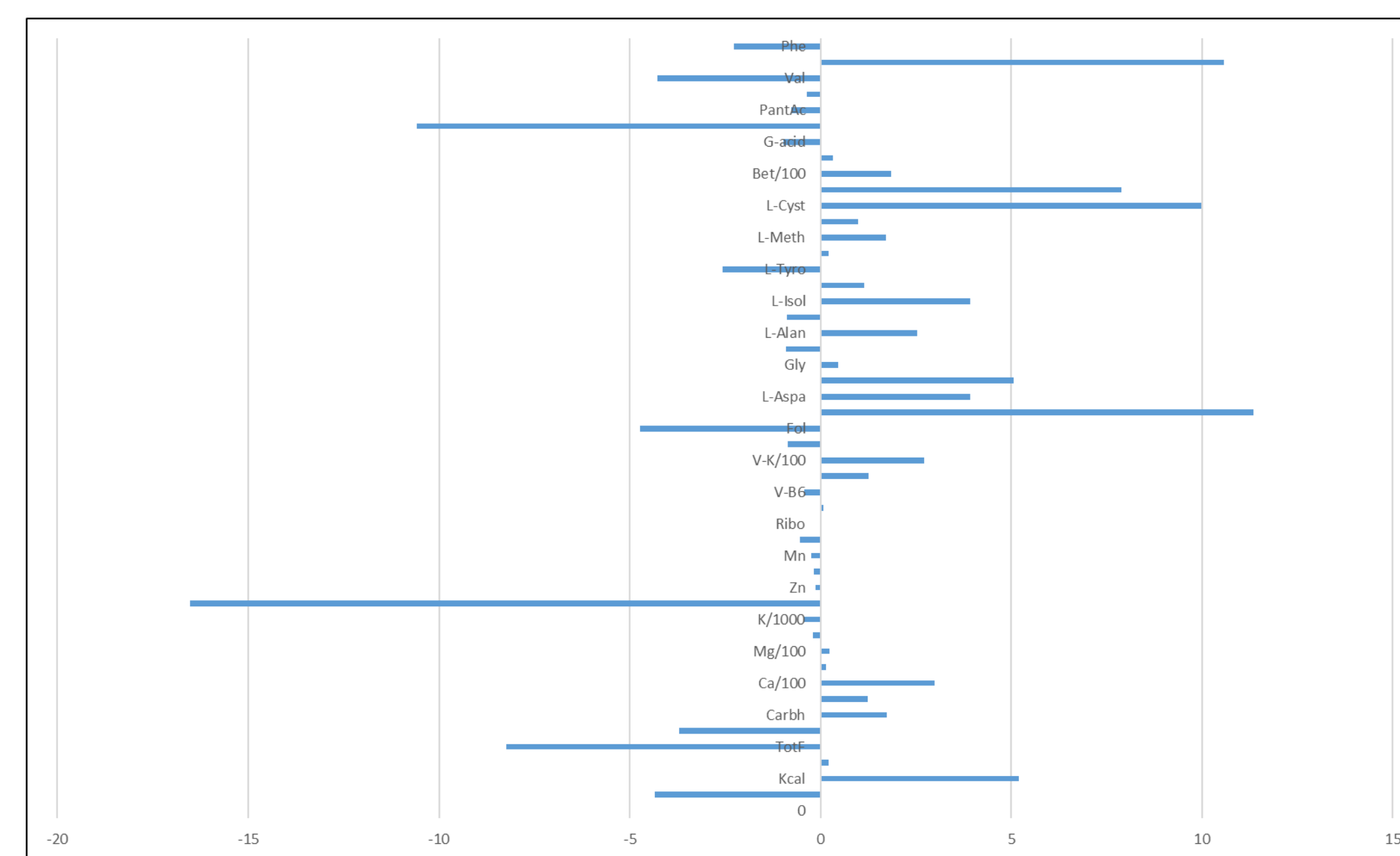


Figure 3. Nutrient profile of *Chenopodium album*  
Legend: Phe = (±) Phenylalanine; Val = (±) Valine; PantAc = Pantothenic acid; G-acid = Glutamic acid; Bet = Betaine; L-Cyst = L-Cysteine; Meth = L-Methionine; L-Tyro = L-Tyrosine; L-Isol = L-Isoleucine; L-Alan = L-Alanine; Gly = Glycine; Fol = Folate; V-K = Vitamin K; Ribo = Riboflavin; Mn = Manganese; Zn = Zinc; K = Potassium; Mg = Magnesium; Ca = Calcium; Carbh = Carbohydrate; TotF = Total fat lipid; Kcal = Energy.

## Conclusions

- Chenopodium album* is a valuable natural source of nutrients, rich in vitamins and essential amino acids and low in calories.
- Kriging analysis helps map nutrient distribution and identify optimal areas for sustainable wild harvesting.
- Including this wild plant in the diet, supports both human health and environmental sustainability.
- It is easy to find, requires minimal cultivation costs and helps preserve biodiversity.
- Wild plants like *Chenopodium album* contribute to climate-resilient and eco-friendly food systems.

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