The effect of organic production on nutritional and techno-functional characteristics of hemp flour

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INTRODUCTION

Hemp growing is attracting interest as a sustainable crop owing to its role in soil regeneration its low water and input requirements and its high efficiency in trapping carbon dioxide contributing to global warming reduction. Hemp flour has high levels of protein, fat, minerals, fibre, essential fatty acids, bioactive compounds and minerals. Despite significant differences on these characteristics have been observed due to the influence of variety, growing conditions and processing processes, the label of commercial products do not include this information. On the other hand, although it is known that organic production is related with positive effects on environment there is still a lot of controversy about the higher nutritional value of organic foods when they are compared to the conventional foods [5].

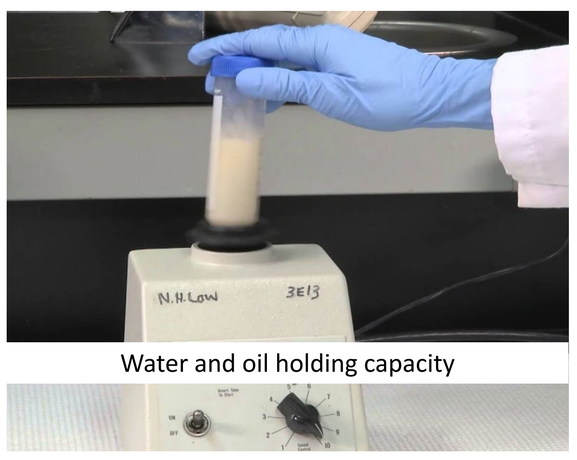
OBJECTIVE

Therefore, the aim of this work was characterize two types of commercial hemp flours, organic vs conventional, in terms of nutritional composition and techno-functional properties.

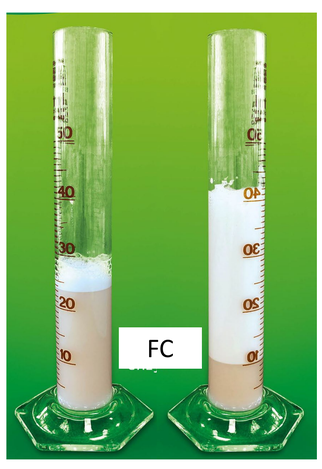
MATERIALS AND METHODS

Two commercial hemp flours, organic and conventional, were purchased by e-commerce.

- Protein (AOAC 950.36), total fat (AOAC 935.38), ash (AOAC 923. 03), fibre (AOAC 991.43) and total carbohydrates were analysed.
- Fat was extracted from 20 g of samples using petroleum ether. The fatty acids were analyzed by gas chromatography after methylation with methanolic KOH using the Lurueña-Martínez et al. (2002) method.
- Mineral analysis was performed by ICP-MS (Vivar-Quintana et al.,2023).
- Extraction of the bioactive components were carried out according to the method of Betances-Salcedo et al., (2017) using 1 g of sample.
- Bioactive compounds analysed were
  - TP: total phenols (Millar et al.,2019)
  - TF: total flavonoids (Valencia et al., 2012)
  - F-DF: total flavanones and dihydroflavonols (Popova et al., 2004)
  - TEAC: total antioxidant capacity (Chen et al.,2021) were also analysed.
- Techno-functional properties studied included water (WHC) and oil holding capacity (OHC), gel formation (GF) water solubility index (WSI), foaming capacity (FC) and stability (FS) and swelling capacity (SC) (Absi et al., 2023)

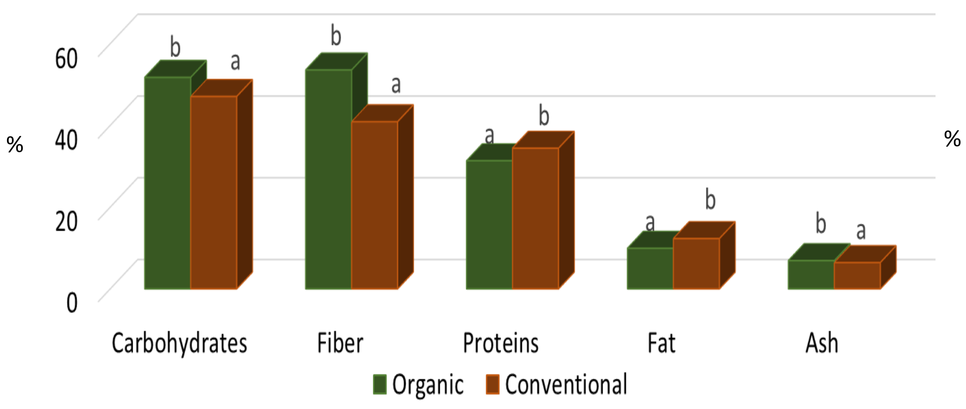


Water and oil holding capacity

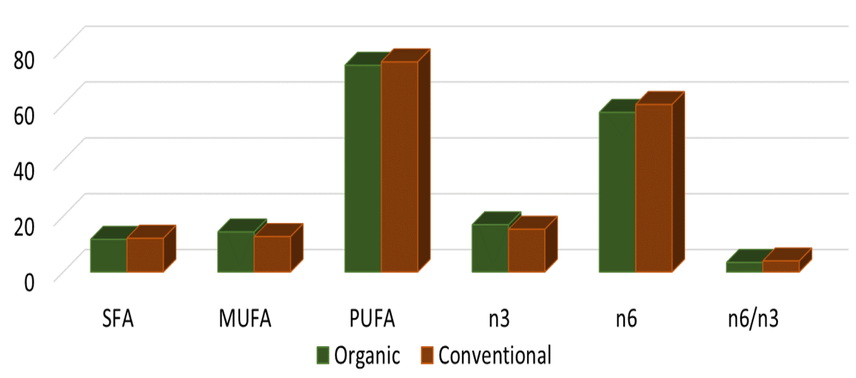


RESULTS

PROXIMATE COMPOSITION

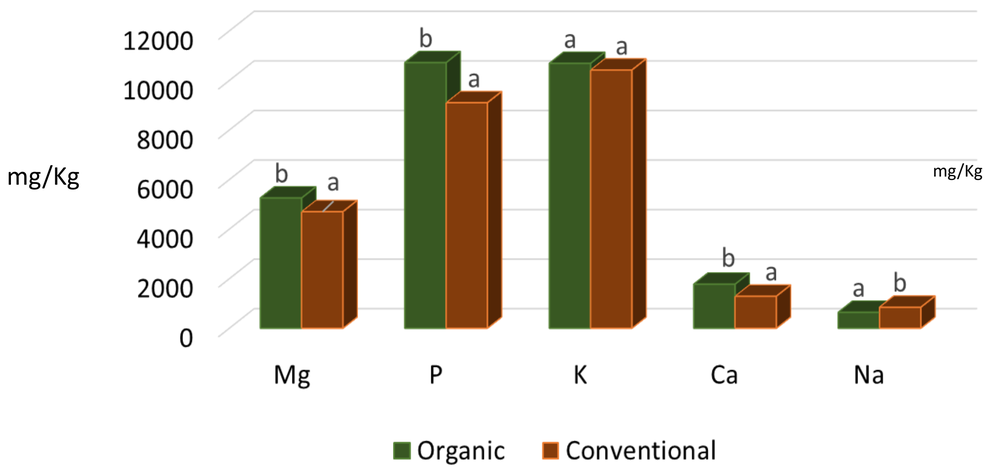


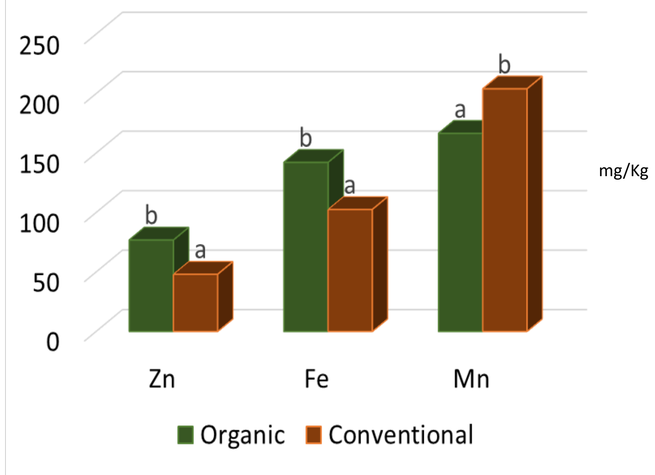
FATTY ACIDS

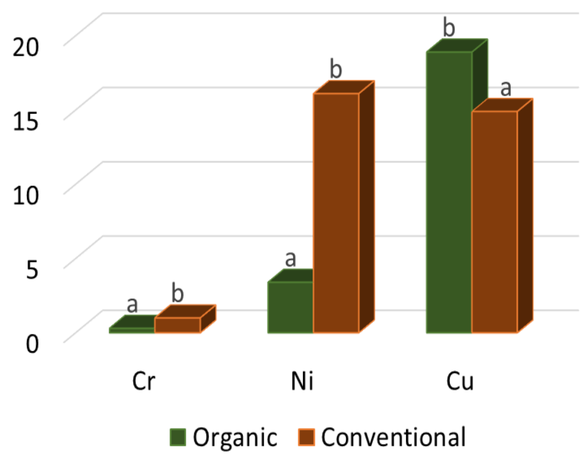


	organic	conventional
C16:0	6.95±0.04a	8.57±0.24a
C16:1	0.11±0.00a	0.21±0.01a
C18:0	3.15±0.01a	2.15±0.43a
C18:1 n9t	0.02±0.00a	0.83±0.41ab
C18:1	13.50±0.06a	10.68±1.16a
C18:2 n6	56.38±0.05b	52.29±2.28b
C20:0	0.89±0.01a	0.71±0.19a
C18:3 n6	0.67±0.00a	6.68±0.61b
C18:3 n3	16.69±0.06b	15.03±1.53b

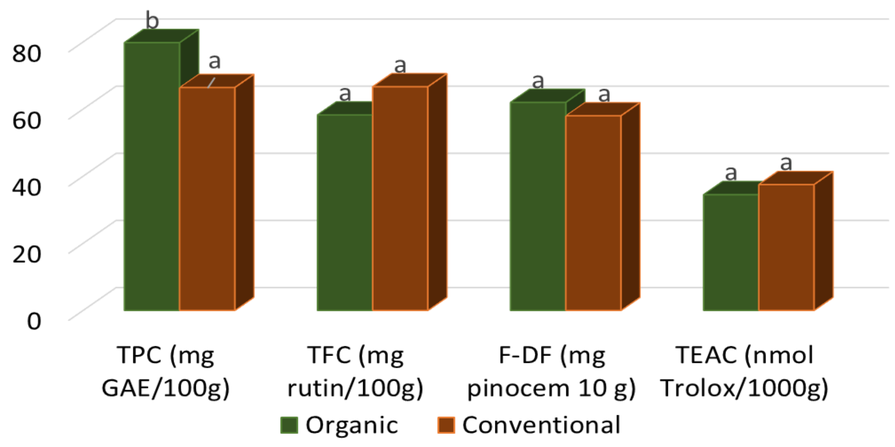
MINERAL CONTENT





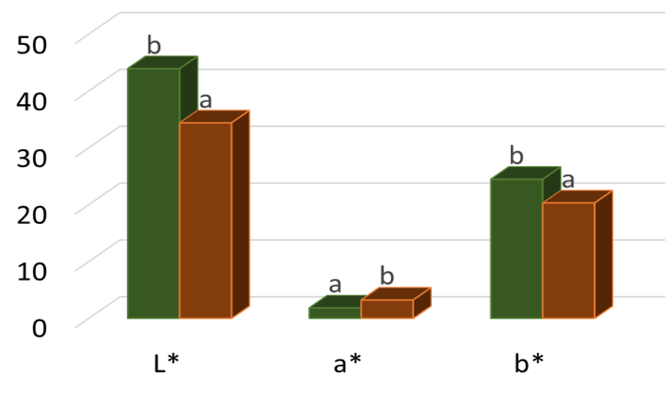


BIOACTIVITY



TECHNO-FUNCTIONAL PROPERTIES

	organic	conventional
WHC (g/g)	2.27a	2.25a
OHC (g/g)	1.19a	1.26a
SC (%)	2.49b	2.11a
WSI (Brix)	4.3a	9.0b
FC (%)	70.35a	68.97a
FS (%)	29.25a	27.04a
GF (N)	71.64a	74.32a



CONCLUSIONS

Hemp flours were characterized by its higher carbohydrate, specifically fibre, the high contents of minerals, specially K and P and lower total fat values because they are marketed partially defatted, being this fat mainly unsaturated.
Organic production increased the content of Na, Mg, P, Ca, Cu, Zn and Fe decreasing the levels of Cr, Ni and Mn. Regarding bioactive compounds, TPC was higher in organic flour, without differences for the rest of the parameters. The colour of the organic flour was lighter with significant higher value of a* and lower value of b*. No significant differences in techno-functional properties were observed. Thus, organic flours are a good alternative for both consumers and industrial applications.

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The investigation of the properties of organic hemp flour is aligned with SDG2, specifically with 2.4 target because cultivation of this crop in an organic system helps to ensure sustainable food production systems and to implement resilient agricultural practices that help maintain ecosystems, that strengthen capacity for adaptation to climate change and that progressively improve land and soil quality