

Labelling and Traceability of Potatoes in the Canary Islands: An Isotopic Approach

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OVERVIEW

The potato is the basis of the diet of the Canarian population. Due to its high demand, it is necessary to import potatoes from other countries, mainly from the UK. These imported potatoes compete and cause fraud in the markets due to mislabelling. The determination of the carbon isotope ratios of locally grown and imported potatoes was carried out. The results were analysed and significant differences were observed for the carbon isotope ratios.

INTRODUCTION

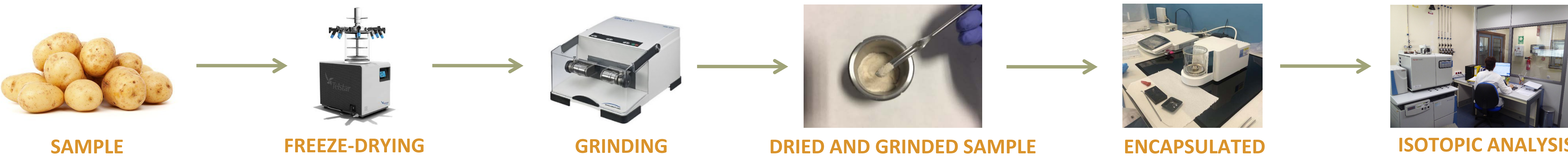
The Potato (*Solanum tuberosum* L.) is a staple food in the diet of the Canary Islanders. In this outermost region of the European Union (Figure 1), potato cultivation has an important cultural and economic value. Currently, local production cannot meet the high demand for potatoes, leading to imports from the others countries, with the United Kingdom (UK) being the main supplier. This dependence on international markets is necessary to satisfy local demand. However, competition with local production is intensified by inadequate labelling practices in local markets, which can contribute to food fraud and mislabelling issues. In this work, carbon isotope ratios were studied by Elemental Analysis Isotope Ratio Mass Spectrometry (EA-IRMS) to determine their usefulness to verify the authenticity and geographical origin of these crops.



Figure 1.- Geographical situation of the Canary Islands in Europe and other importing countries

METHODS

A total of 168 potato samples identified as locally grown (Canarias, N = 124) and imported (UK, N = 22; Cyprus, N = 9; Egypt, N = 9; Israel, N = 5) were collected from marketplaces in Canary Islands between 2021 and 2023. The samples were processed and freeze-dried and milled for isotopic analysis. The carbon ($\delta^{13}\text{C}$) isotope ratios were determined using the standard delta notation formula (Coplen, 2011), where values are expressed to a reference standard in part per thousand (‰). Statistical analysis was performed to the samples using open-source software.



RESULTS

First, the $\delta^{13}\text{C}$ values were grouped according to the origin of the samples, showing statistically significant differences between imported and local potatoes. Cypriot, Egyptian and Israeli samples showed very different values, while UK samples were closer to the Canarian samples (Figure 2). Secondly, the samples were analysed according to the place where they were purchased (supermarkets, public market and the countryside). Outliers were detected in samples purchased in public market, which could be due to mislabelling. In supermarkets, traceability showed better data consistency, with a lower data dispersion than in other data sets, but inconsistencies were still found (Figure 3 and Figure 4). One-way analysis of variance (ANOVA) confirmed statistically significant differences according to geographical origin, showing that samples from the Canary Islands showed significantly different $\delta^{13}\text{C}$ values.

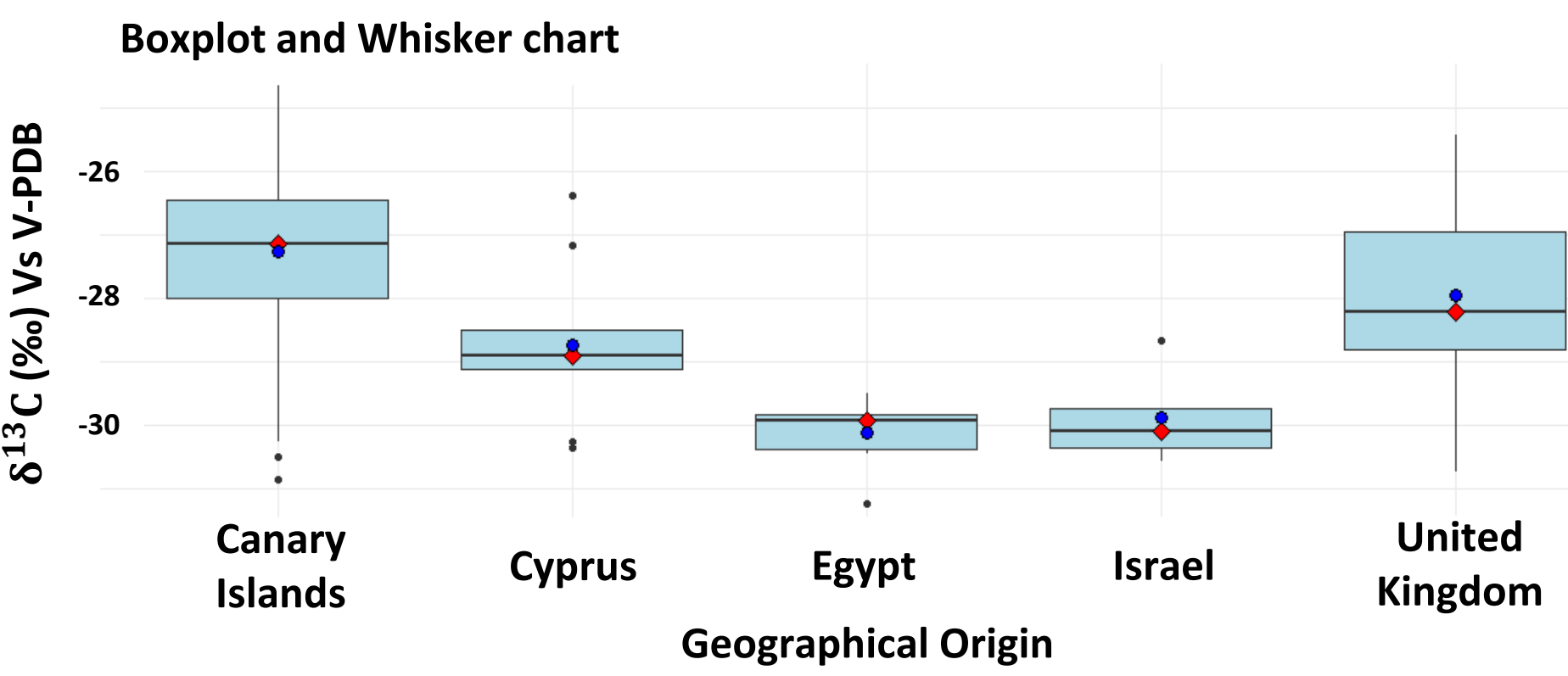


Figure 2.- Box and whisker plot for $\delta^{13}\text{C}$ values by origin

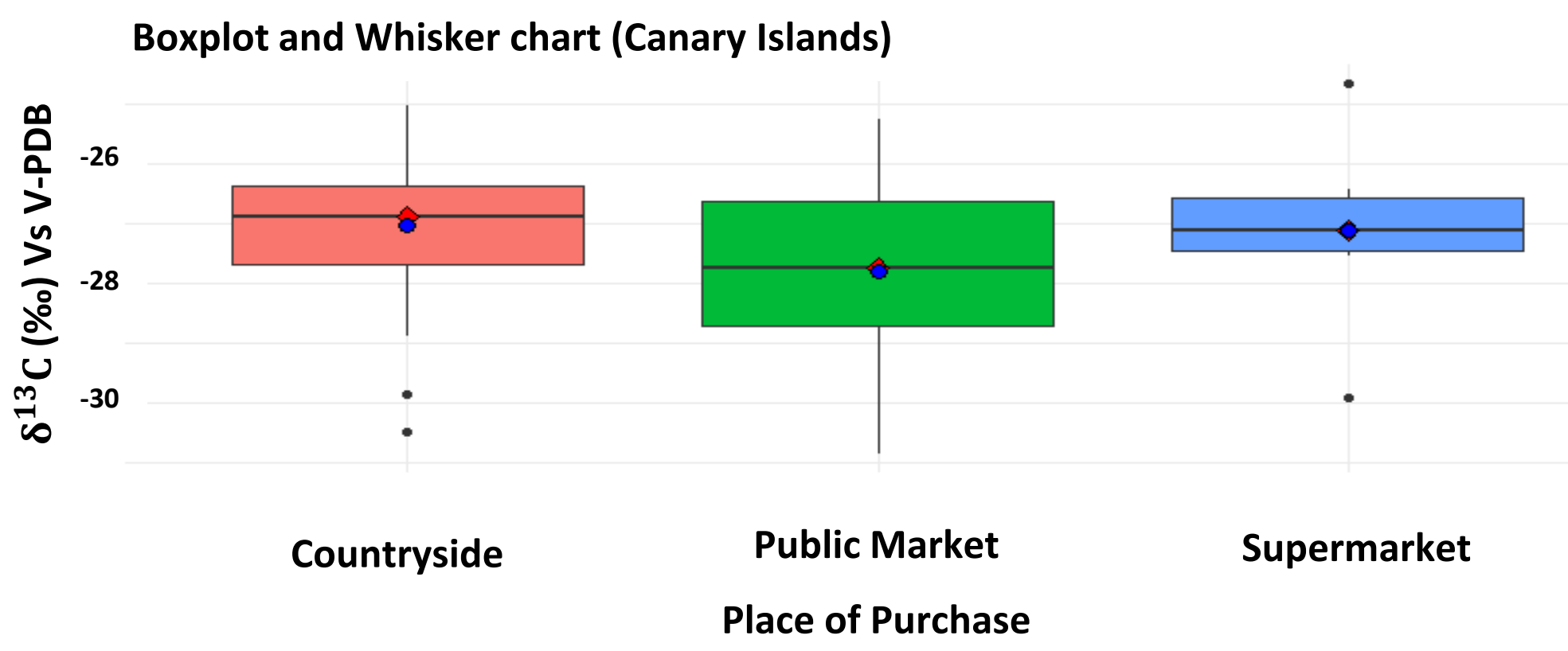


Figure 3.- Box and whisker plot for $\delta^{13}\text{C}$ values by Place of Purchase (Canary Islands)

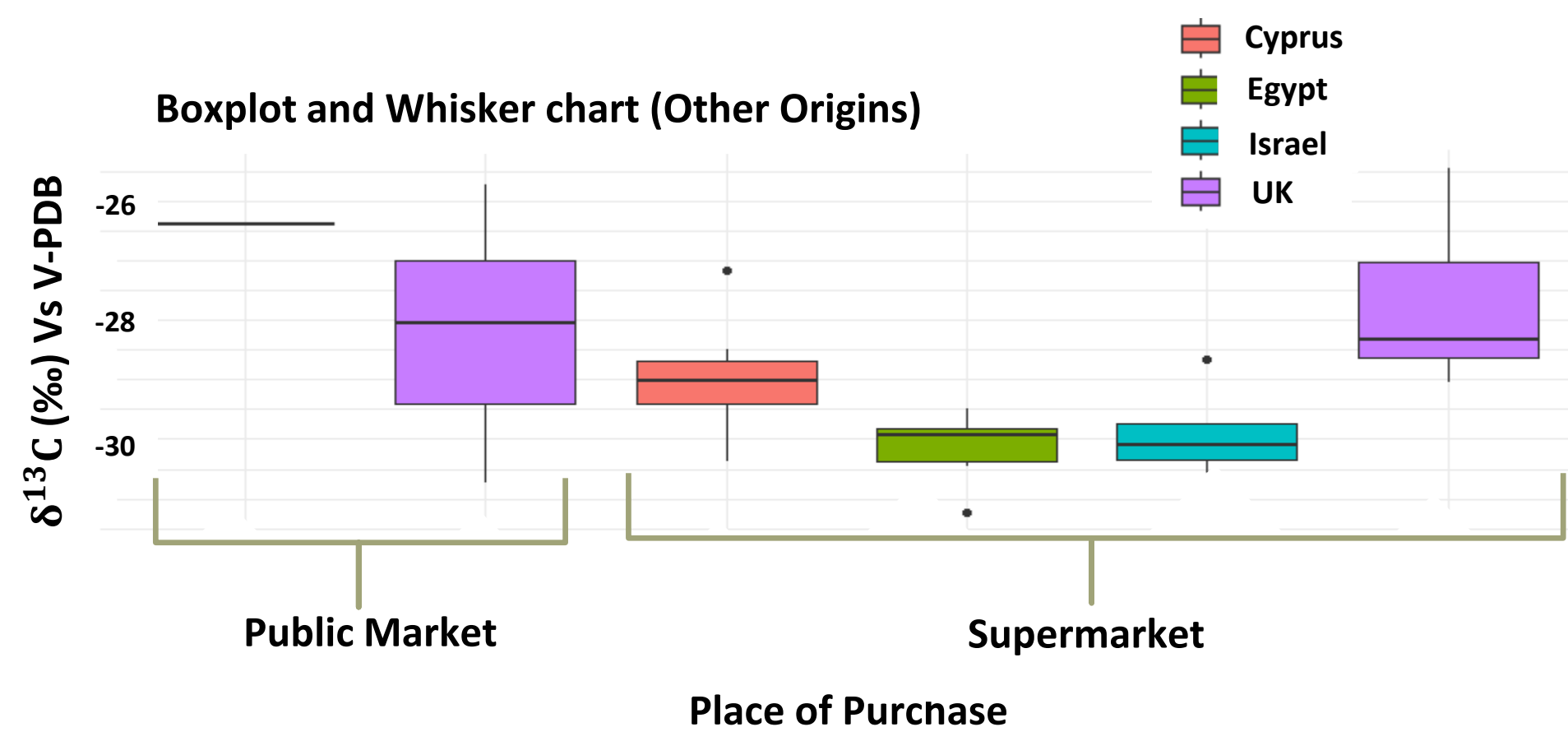


Figure 4.- Box and whisker plot for $\delta^{13}\text{C}$ values by Place of Purchase (Other Origins)

CONCLUSIONS

This study would permit the isotopic characterisation of potatoes grown in the Canary Islands in order to prevent fraud in marketing and ensure the authenticity of local products in the Canary Islands. Food fraud and the geographical origin of potatoes marketed in the Canary Islands cannot be rigorously identified by this parameter alone. Additional analytical parameters must be added to develop a robust mathematical classification model. Finally, collaboration with local farmers and authorities is needed to increase the database and improve marketing control.

BIBLIOGRAPHIC REFERENCES

T. B. Coplen, "Guidelines and recommended terms for expression of stable-isotope-ratio and gas-ratio measurement results," Rapid Communications in Mass Spectrometry, vol. 25, no. 17, pp. 2538–2560, 2011, doi: 10.1002/rcm.5129.

ACKNOWLEDGMENTS

This work has been funded by the European Union - Next Generation EU. Investigo Program 2022 and 2023.