

Valorizing Traditional Greek Wheat Varieties: Use of DNA Barcoding for Species Identification and Biochemical Analysis of Their Nutritional Value

Niki Mougiou, Spyros Didos, Ioanna Bouzouka, Athina Theodorakopoulou, Michael Kornaros,
Anagnostis Argiriou

Abstract— Grains from traditional old Greek cereal varieties were evaluated and compared to commercial cultivars, like Simeto and Mexicali 81, in an effort to valorize local products and assess the nutritional benefits of ancient grains. The samples studied in this research included common wheat, durum wheat, emmer (*Triticum dicoccum*) and einkorn (*Triticum monococcum*), as well as barley, oats and rye grains. The Internal Transcribed Spacer 2 (ITS2) nuclear region was amplified and sequenced as a barcode for species identification, allowing the verification of the label of each product. After that, the total content of bound and free polyphenols and flavonoids, as well as the antioxidant activity of bound and free compounds, was measured by classic colorimetric assays using Folin-Ciocalteu, AlCl₃ and DPPH· (2,2-diphenyl-1-picrylhydrazyl) reagents, respectively. Moreover, the level of variation of fatty acids was determined in all samples by gas chromatography. The results showed that local old landraces of emmer and einkorn had the highest polyphenol content, 2.4 and 3.3 times higher than the average value of 5 durum wheat samples, respectively. Regarding the total flavonoid content, einkorn had 2.6-fold and emmer 2-fold higher values than common wheat. The antioxidant activity of free or bound compounds was at the same level, at about 20-30% higher in both einkorn and emmer compared to common wheat. Five main fatty acids were detected in all samples, in order of decreasing amounts: linoleic (C18:2) > palmitic (C16:0) ≈ , oleic (C18:1) > eicosenoic (C20:1, cis-11) > stearic (C18:0). Emmer and einkorn showed a higher diversity of fatty acids and a higher content of mono-unsaturated fatty acids compared to common wheat. The results of this study demonstrate the high nutritional value of old local landraces that have been put aside by more productive, yet with lower qualitative characteristics, commercial cultivars, underlining the importance of maintaining sustainable agricultural practices to ensure their continued cultivation.

Keywords— Biochemical analysis, nutritional value, plant barcoding, wheat.

N. Mougiou is with the Institute of Applied Biosciences, Centre for Research and Technology Hellas, Themi, 57001 Thessaloniki, Greece (e-mail: nmougiou@certh.gr).

S. Didos and A. Argiriou are with the Institute of Applied Biosciences, Centre for Research and Technology Hellas, Themi, 57001 Thessaloniki, Greece and with the Department of Food Science and Nutrition, University of the Aegean, Myrina, 81400 Lemnos, Greece (e-mail: sdidos@certh.gr, argiriou@certh.gr).

I. Bouzouka is with the Institute of Applied Biosciences, Centre for Research and Technology Hellas, Themi, 57001 Thessaloniki, Greece and with the Department of Medicine, Aristotle University of Thessaloniki, 54154 Thessaloniki, Greece (e-mail: ibouzouka@certh.gr).

A. Theodorakopoulou and M. Kornaros are with the Department of Chemical Engineering, University of Patras, 26504 Patras, Greece (e-mail: theoathina@gmail.com, kornaros@chemeng.upatras.gr).