

Effect of Blanching on the Nutritional, Antioxidant and Microbiological Quality of Dried Plums

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Background and Objective

Dried plums are a nutrient-rich snack with health-promoting properties. However, their natural wax layer limits moisture diffusion and consequently prolongs drying time. Targeted blanching creates surface microcracks that improve moisture transfer and shorten drying time [1]. The aim of this study was to develop a standardized, industrially scalable blanching procedure for the Chuyskaya krasavitsa cultivar.

Materials and Methods

1 Blanching

1% citric acid, 85 °C vs. hot water, 100 °C — 3 min each

2 Preparation

Halving and pitting of blanched plums

3 Drying

Hot-air convection dryer, 70 °C, 18 h (residual moisture ≈ 15%)

4 Analysis

Macro-/micronutrients, polyphenols (TPC), antioxidant activity (CUPRAC, ABTS, FRAP), microbiology



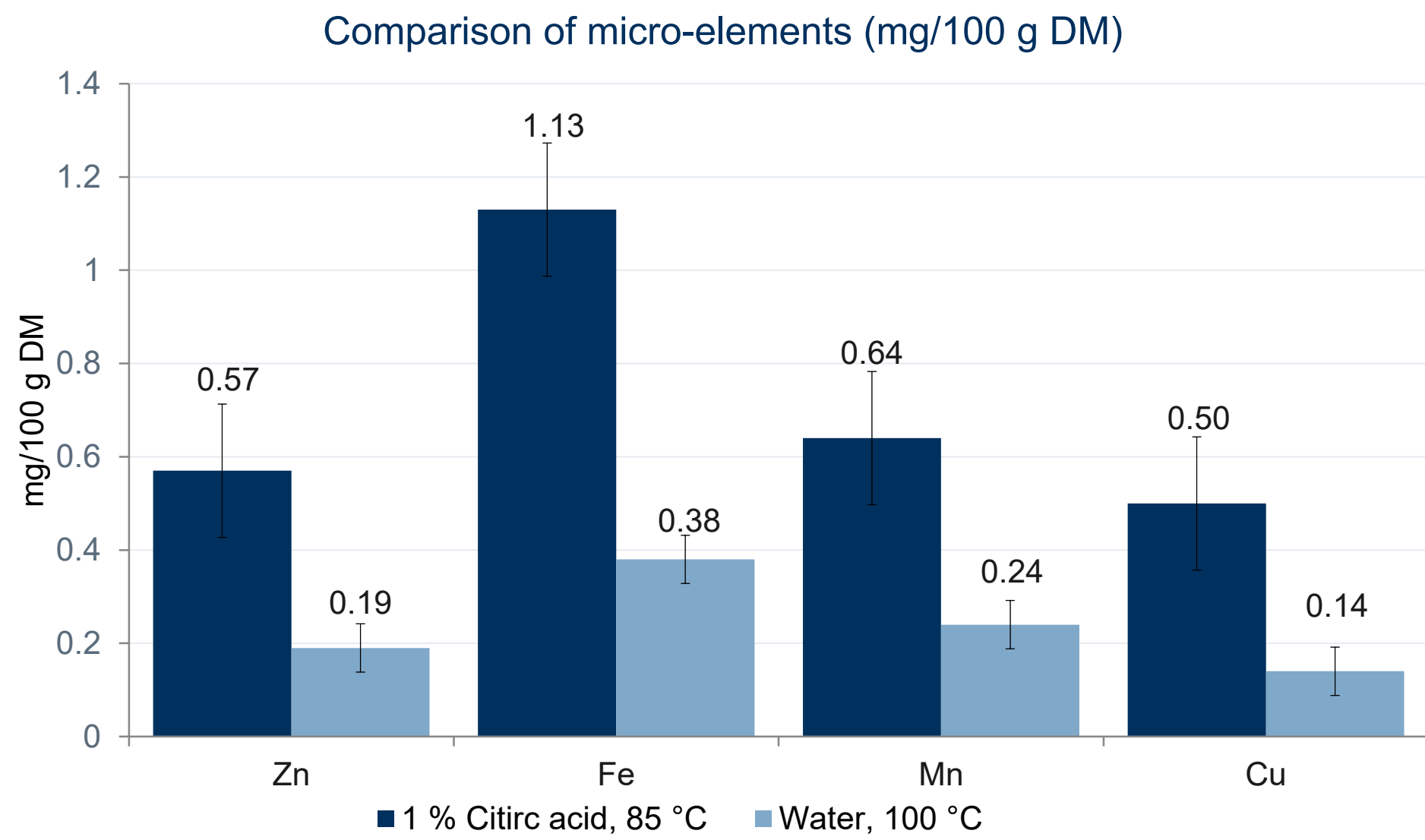
Plums cultivar : Chuyskaya krasavitsa

Results: Composition

Table 1 — Chemical composition (wet basis) of dried plums

Parameter	1% citric acid	Hot water	Reference [2]
Moisture, g/100 g	15.26 ± 0.00 a	16.31 ± 0.00 a	32.4
Water activity aw	0.43 ± 0.01 a	0.41 ± 0.04 a	n.b.
Protein, g/100 g	2.79 ± 0.12 a	2.06 ± 0.21 b	2.6
Sorbitol, g/100 g	19.51 ± 0.04 b	20.67 ± 0.06 a	14.7
Glucose, g/100 g	14.77 ± 0.21 b	22.36 ± 0.43 a	23.1
Fructose, g/100 g	15.39 ± 0.00 b	18.57 ± 0.04 a	13.1
Sucrose, g/100 g	0.92 ± 0.10 a	0.65 ± 0.13 b	0.6
Crude fibre, g/100 g	3.87 ± 0.26 a	3.08 ± 0.10 b	n.b.

Data: mean (n = 3) ± SD; different letters indicate a significant difference (p ≤ 0.05).



Samples with 1 % citric acid 85 °C for 3 min and hot-air dried

Samples blanched with water at 100 °C for 3 min and hot-air dried

Results: Antioxidant Capacity

Table 3 — Total phenolic content & antioxidant capacity (70% v/v ethanol extract)

Parameter	1% citric acid	Hot water, 100 °C
CUPRAC, μmol TE/g DM	35.90 ± 3.17 a	39.57 ± 2.14 b
ABDM, μmol TE/g DM	102.86 ± 26.26 a	77.43 ± 8.39 b
FRAP, μmol TE/g DM	7.21 ± 0.34 b	14.32 ± 14.39 a

DM= dry matter; GAE = gallic acid equivalent; TE = Trolox equivalent. Values for 50% and 84% ethanol are reported in the publication.

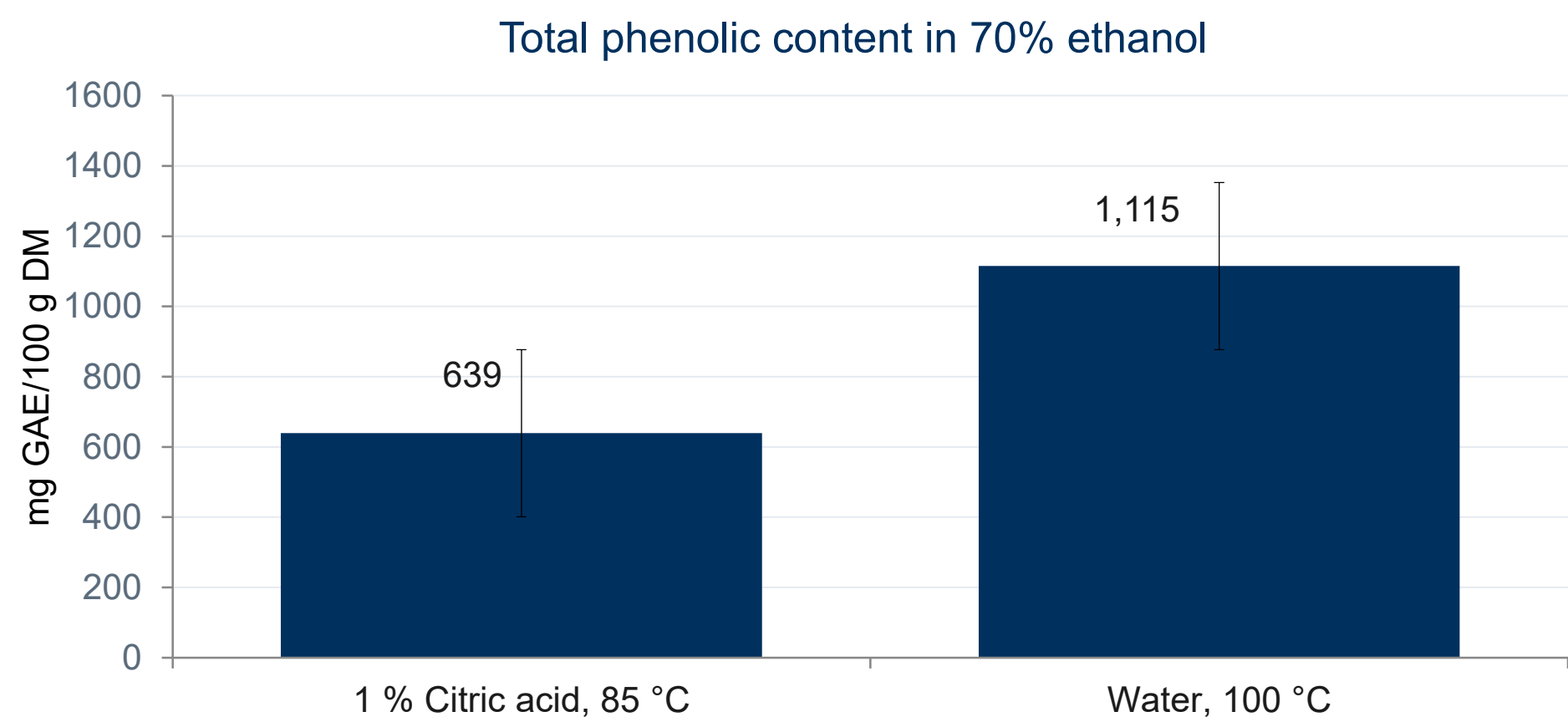


Table 4 — Significantly different polyphenols (μg/g TS, selected compounds)

Compound	Citric acid, 85 °C	Hot water, 100 °C
Neochlorogenic acid	484.84 ± 430.38 b	954.41 ± 199.99 a
Chlorogenic acid	71.37 ± 61.92 b	151.07 ± 34.67 a
Isoquercitrin	16.20 ± 13.37 b	71.83 ± 36.61 a
Hyperosid	97.93 ± 73.40 b	187.73 ± 30.66 a
Procyanidin A1	1.28 ± 1.76 b	18.83 ± 13.02 a
Ferulic acid	2.84 ± 0.93 b	3.60 ± 1.51 a
Caffeic acid	0.29 ± 0.35 b	0.43 ± 0.34 a

Mean ± SD; different letters indicate a significant difference (p ≤ 0.05). See the publication for the complete list (19 compounds).

Results: Microbiology

Total aerobic counts of dried plums ranged from 1.00 to 1.77 log CFU/g, while yeast and mould counts ranged from 1.26 to 2.00 log CFU/g.

Hot-water blanching reduced aerobic microorganisms (p<0.001) and yeasts/moulds (p<0.01) more strongly than citric acid treatment and increased sugar and total phenolic contents (p<0.05); however citric acid treatment increased mineral contents (p<0.05).

Acknowledgements: This work was funded by the GIZ project “Vocational training for economic growth sectors in Central Asia” (No. 2023-PRO-000999; No. 81295537) and the Federal Ministry of Research, Technology and Space (BMRTS) project “SUFACHAIN” (grant number FKZ: 01LZ2201 B).

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Conclusion

Hot-water blanching or treatment with wax-removing agents plays a crucial role in achieving optimal drying conditions for plums. This study investigated the effects of hot-water blanching and a citric acid solution before hot-air drying on nutrient retention and microbiological safety in the dried plum. The blanching methods significantly affected sugar, protein, and total phenolic compound (TPC) contents. Microbiological analyses indicated that, to ensure optimal safety, plums should be pretreated with hot water (100 °C) for 3 min; citric acid treatment also achieved an acceptable level of safety. Hot-water blanching and hot-air drying also showed higher levels of sorbitol, monosaccharides, and amino acids. However, citric acid blanching resulted in more effective mineral retention and higher *in vitro* antioxidant activity (measured by FRAP and CUPRAC methods) than hot-water treatment.