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Fatty acid assessment in pears after Ca enrichment with $CaCl_2$

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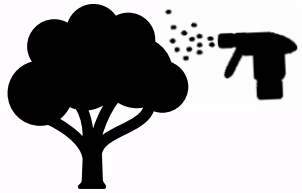
Food sector

- Mineral deficits can promote heath issues
- Ca deficits can affect growth and locomotion
- Rocha pear: Valuable for country`s economy
- Lipids contribute to celular compartmentalization

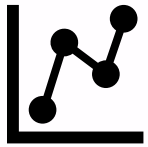
Ca workflow

- Agronomic biofortification
- Foliar sprays
- T1 = 4 $kg.ha^{-1}$ $CaCl_2$
- T2 = 4 - 8 $kg.ha^{-1}$ $CaCl_2$



Analysis

- Ca content in fruits
- TFA
- DBI
- MDA
- FA profile



This study aimed to test the efficiency of $CaCl_2$ on Rocha pear variety, while simultaneously monitor any impact to the fatty acids (FA) content of sprayed fruits

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Abstract: Human malnourishment is a current problem of society and agronomic biofortification is a procedure that wishes to tackle these mineral deficits in human diets by increasing a specific nutrient on the edible part of food crops. Thus, an agronomic enrichment workflow with seven foliar sprays of $CaCl_2$ (with concentrations between 4 - 8 kg/ha), was performed in an orchard located in the West region of Portugal. Besides Ca enrichment assessment in fruits (with a portable x-ray fluorescence analyzer) at harvest, fatty acids (FA) quantification and FA profile (acquired with a gas–liquid chromatograph, coupled to a flame ionization detector (GC-FID)), DBI and lipoperoxidation values (with a spectrophotometer) were also attained. Increases of Ca in sprayed fruits reached 7.6 % to 44.3 %. For FA related parameters, no significant differences were observed, suggesting that Ca sprays did not impact these parameters. Total fatty acids (TFA), double bond index (DBI) and lipoperoxidation values varied between 0.72 - 0.74 g/100 g FW, 8.13 - 9.83 and 2.23 - 3.18 μM /g FW respectively. The following FA profile was attained: C18:2 > C16:0 > C18:3 > C18:0 > C18:1 > <C16:0. No significant differences were observed. In summary, CaCl2 can be used to increase Ca levels in fruits allowing the production of fruits with prophylactic characteristics, while the concentrations from this study did not impact their FA content.

Keywords: Ca content in fruit; DBI; Fatty acids profile; *Pyrus communis* L.; Lipoperoxidation; TFA

Introduction

- Mineral deficits in human diets can promote heath issues
- Ca deficits can affect growth and locomotion ability
- Agronomic biofortification: strategy to acquire foods with higher contents of a selected mineral
- Rocha pear: fruit that contributes to Portugal's economy, since over half of its production is exported
- Lipids: present in low quantities on pears but modification of these structures can be related to the development of diseases in post-harvest

Results

Table 1. Mean values (n = 4) and standard error of Ca content, TFA, DBI and MDA of Rocha pear fruits at harvest. Letters a and b represent significant differences between treatments for each parameter ($P \leq 0.05$)

Treatment	Ca (%)	TFA (g/100 g FW)	DBI	MDA (μM /g FW)
Control	0.131b ± 0.017	0.72a±0.10	9.09a±0.88	2.91a±0.11
T1	0.141b ± 0.002	0.74a±0.05	8.13a±0.29	3.18a±0.05
T2	0.189a ± 0.002	0.74a±0.10	9.83a±1.47	2.39a±0.33

At harvest:

- Lower Ca contents were reported in the control, while T2 presented significantly higher values than the other treatments (increases ranged from 7.6 % to 44.3 %)
- For the remaining parameters (TFA, DBI and MDA), no significant differences were reported
- Values varied between:

  TFA: 0.72 and 0.74 g/100 g FW

  DBI: 8.13 and 9.83

  MDA: 2.23 and 3.18 μM /g FW

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Results

Table 2. Mean values (n = 4) and standard error of FA profile of Rocha pear at harvest. Letter a indicates the absence of significant differences between treatments in the different parameters ($P \leq 0.05$)

Treatment	mol %					
	< C16:0	C16:0	C18:0	C18:1	C18:2	C18:3
Control	1.76a±0.27	13.13a±1.25	5.37a±1.31	3.60a±0.89	66.76a±1.33	9.31a±1.68
T1	1.21a±0.07	15.97a±0.49	4.07a±0.19	2.34a±0.12	67.47a±1.24	8.75a±0.83
T2	1.76a±0.23	14.87a±1.75	2.96a±0.54	2.82a±0.22	69.08a±1.99	8.34a±0.62

- The profile of FA was characterized by the highest abundance of linoleic acid (C18:2), followed by palmitic acid (C16:0) and linolenic acid (C18:3). Stearic (C18:0) and oleic (C18:1) acids were the least abundant, while there was also a small percentage of FA with C chains lower than C16 (<C16:0)
- No significant differences were observed

Conclusions

- The concentrations of $CaCl_2$ used in this study led to increases of Ca content in Rocha pear fruits

- Foliar concentrations did not affect FA content of fruits

- Membrane well-functioning and cell compartmentation was well kept indicating less prospects to storage losses

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