

The Effect of Citrus Fruit Extract on the Oxidative Stability of Wafers Cream during Storage



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BACKGROUND

Fat-based cocoa cream is a popular filling in wafers. It consists of plant oils, sugar, cocoa powder and other compounds including flavour. Due to the high lipid content this product is prone to peroxidation during storage. The quality of product is changing during long-term storage so the investigating the quality whole shelf life is crucial.



Fig. 1. Wafers with cocoa cream

OBJECTIVES

The aim of the study was to examine the effect of addition citrus fruit extract (Flavomix BC, polypan) on the stability of lipids extracted from cream of fresh and stored wafers samples (3, 6, 8, 10, 12 and 13 months).

MATERIALS

Two samples of cocoa cream were prepared. First, the reference sample, was cocoa cream prepared according to the standard recipe (WT). To the second (WTE) a citrus fruit extract (Flavomix BC, polypan) in the amount of 0.1 % (w/w) was added. Both creams were spreaded on the wafer sheets, cooled, cutted and immediately wrapped in polypropylene foil. Samples were stored in the boxes in a dark place at temperature of $18\text{ °C} \pm 2\text{ °C}$ and relative humidity in the range 60–65 % for 13 months.

METHODS

Color measurements of creams (CIE LAB L^* , a^* , b^*) were carried out using the Konica Minolta CM-5 spectrophotometer and the SpectraMagic NX software. In order to determine the oxidative stability, fat was extracted from the cream with n-hexane, which was evaporated using a rotary evaporator (Rotavapor® R-300, BÜCHI Labortechnik AG). Differential scanning calorimetry (DSC 8500, Perkin Elmer) was used to determine the OIT (oxidation induction time) index in isothermal conditions (160 °C), while by chemical analyzes the radical scavenging capacity of DPPH and the content of conjugated dienes (CDs) in the extracted fat was assessed.

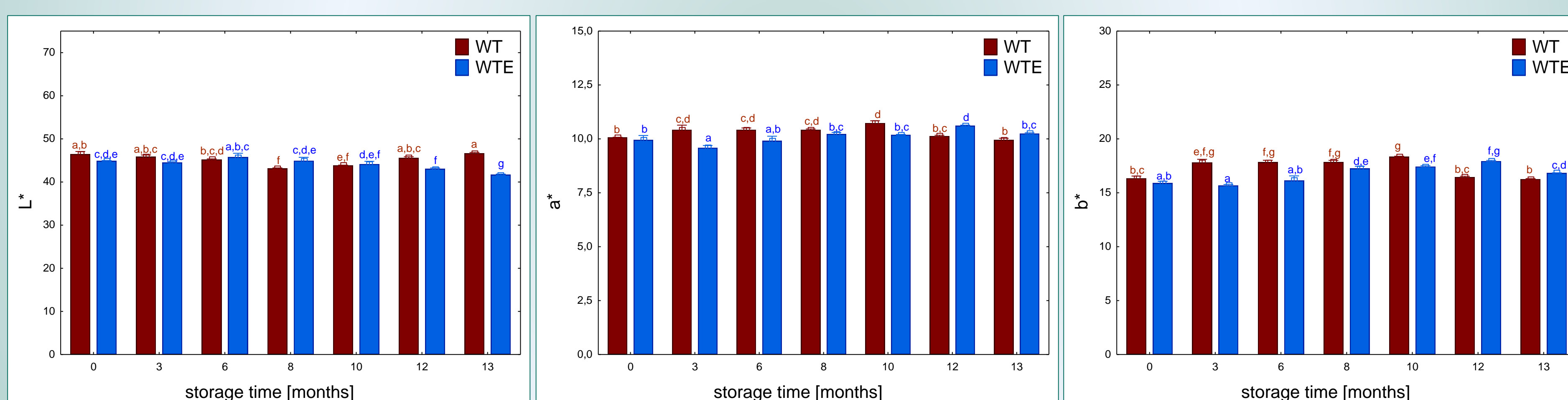


Fig. 2. Konica Minolta CM-5 spectrophotometer, rotary evaporator Rotavapor® R-300, BÜCHI Labortechnik AG and Differential scanning calorimeter DSC 8500

RESULTS

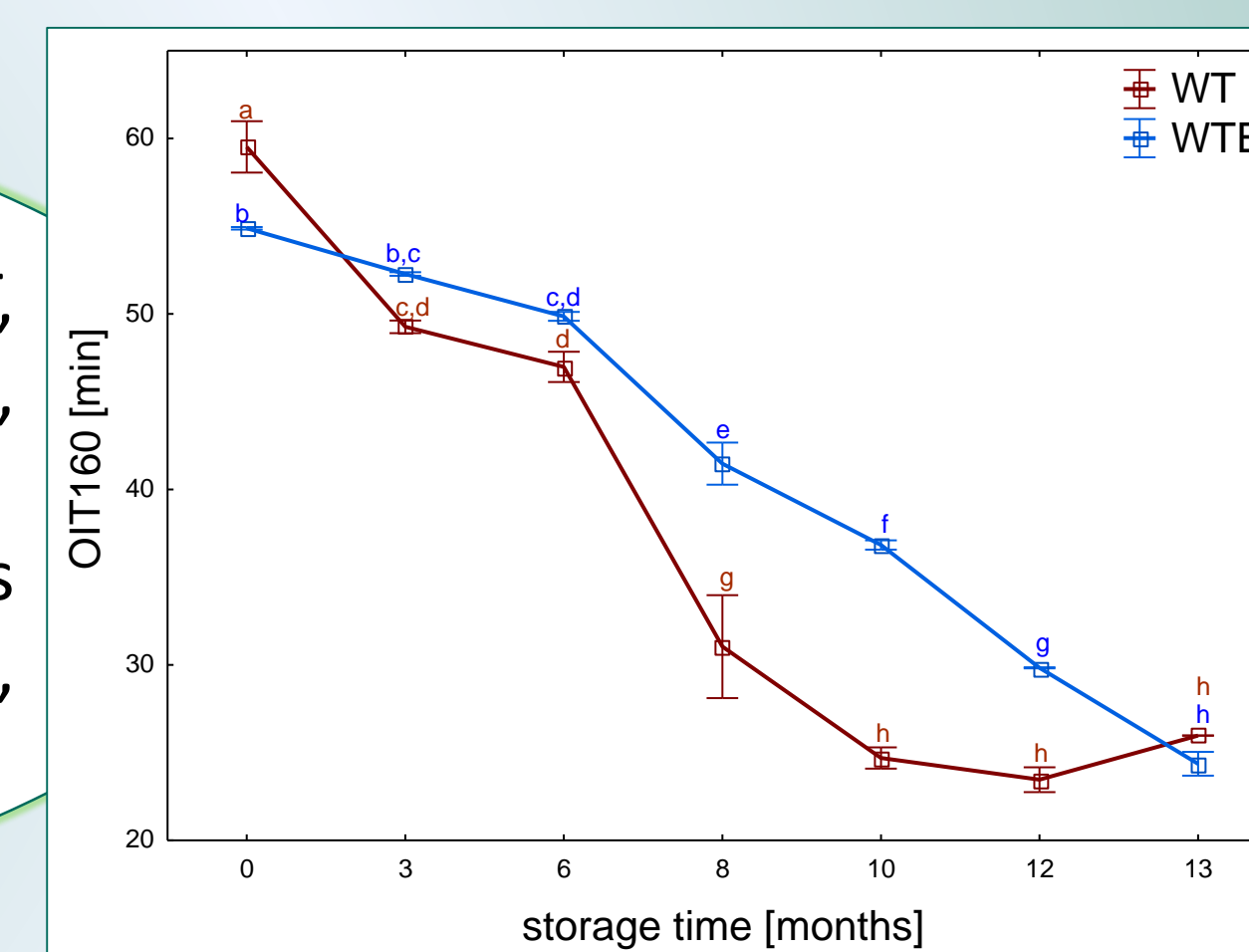
COLOR MEASUREMENT

- ✓ From the eighth month of storage, L^* values for the WT sample were increasing, indicating a lightening of the cocoa cream, while for the WTE sample the opposite trend was noted till the end of storage.
- ✓ For the parameter a^* , no significant changes ($p > 0.05$) were observed after 13 months of storage, both for the WT and WTE samples.
- ✓ Values of b^* indicates were significantly ($p \leq 0.05$) higher after 13 months of storage for the WTE sample



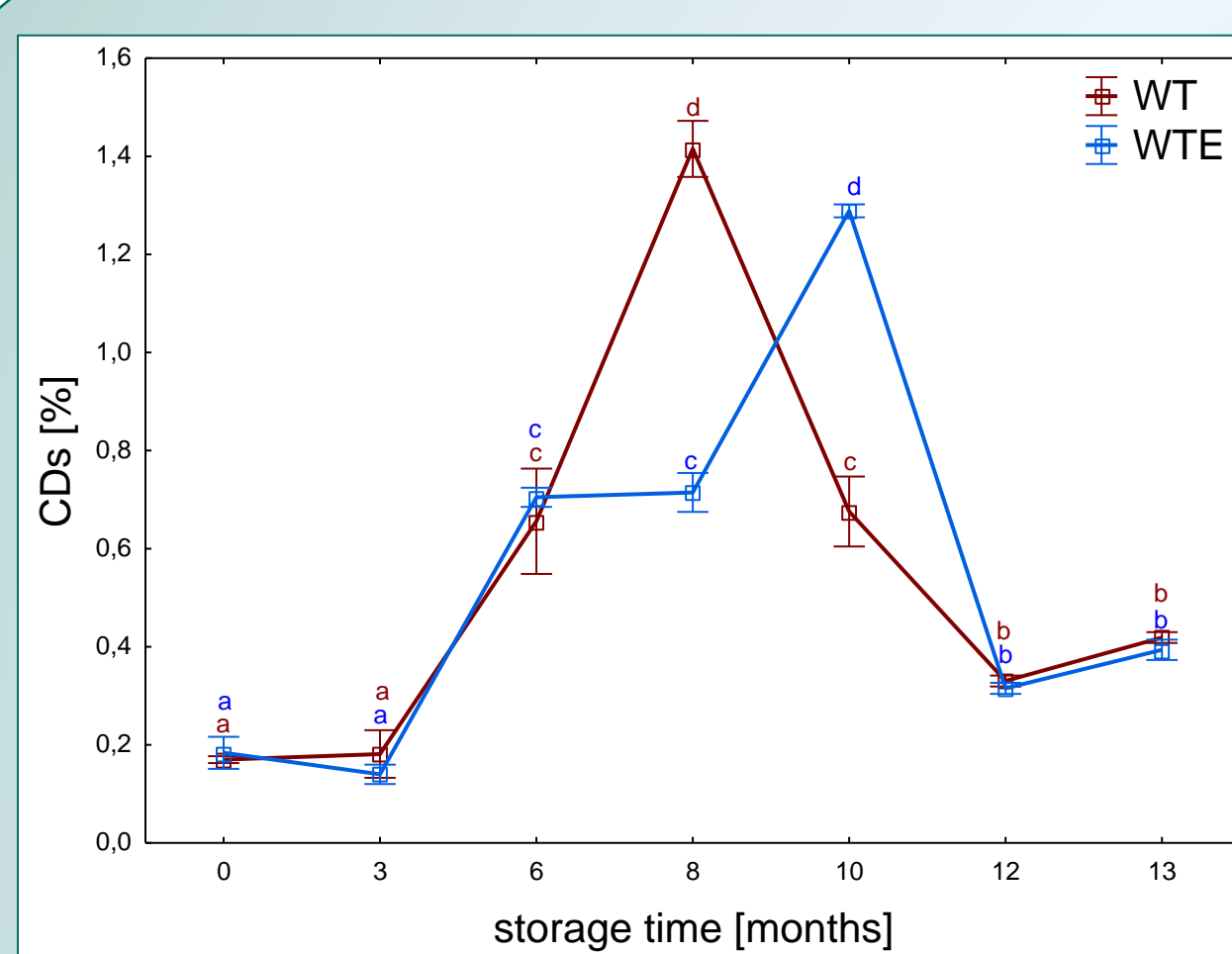
DSC OXIDATIVE STABILITY

- ✓ After 13 months of storage, the OIT160 values for both samples (WT, WTE) were about two times lower, however, until 12 months of storage, the OIT160 values for WTE were always higher than those for WT.
- ✓ Till the end of storage the slope of the linear plot for the OIT160 changes was lower for WTE (-1.81) than for WT sample (-3.41) during storage, indicating a lower rate of OIT160 changes for the WTE sample.

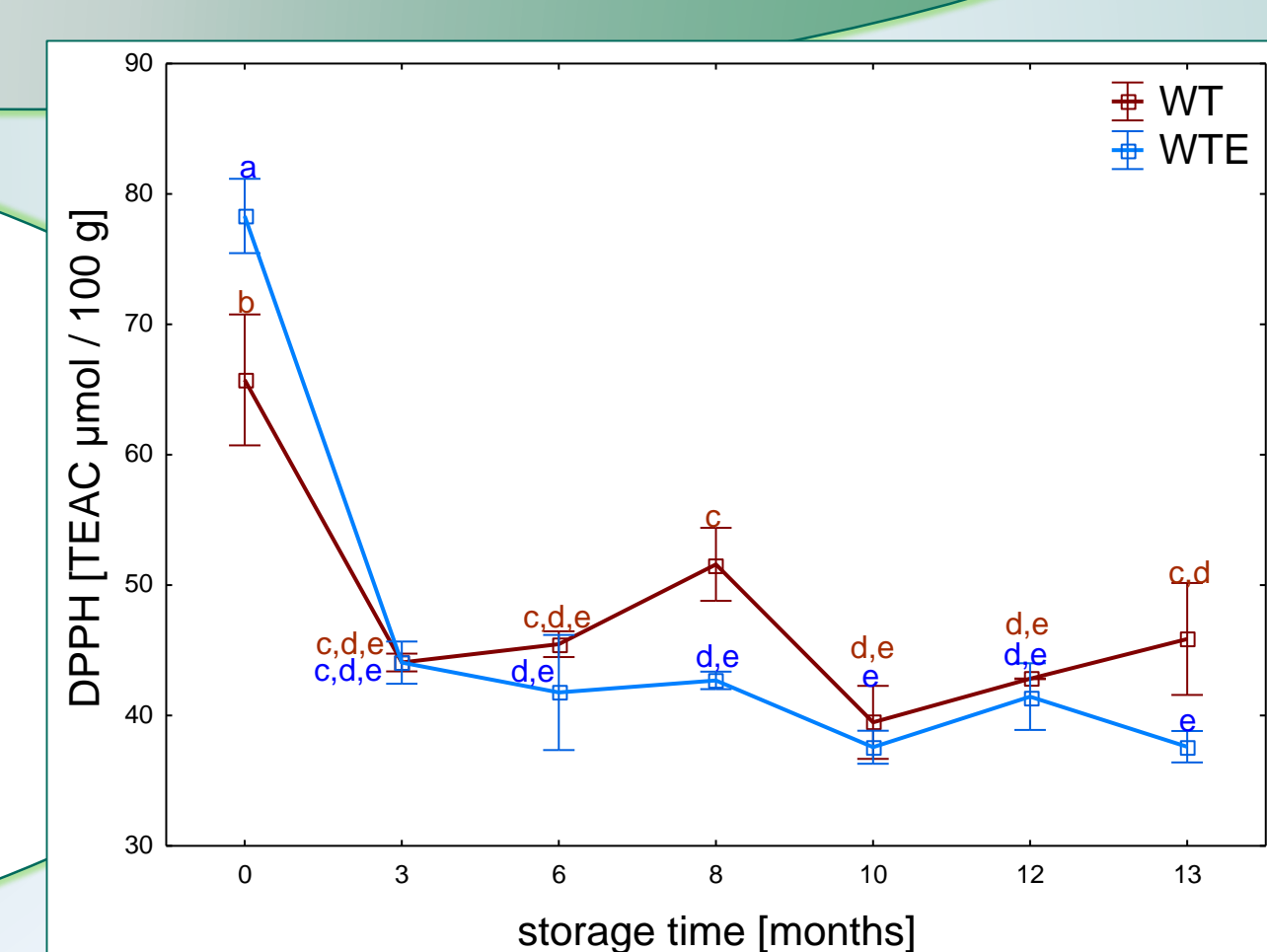


CHEMICAL ANALYZES

- ✓ Similar trend like for OIT160 values was observed for CDs.
- ✓ The slope for exponential plot of CDs values vs. storage time was two times higher for WT than for WTE sample during the first eight months.



- ✓ The DPPH values were higher for the WTE than WT for fresh samples, however after 8 months of storage there is no significant difference between samples the exhaustion of the protective properties of the fruit extract.



CONCLUSIONS

1. The antioxidant stability of both samples (WT, WTE) decreased with the wafers' storage time.
2. The DSC results showed a protective effect of citrus fruit extract up to 12 months of storage, however as measured by CDs and DPPH, this effect was lasted up to 8 months.

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