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FRESH-CUT POTATOES TREATED WITH FENNEL ESSENTIAL OIL: SHELF-LIFE DURING REFRIGERATED STORAGE

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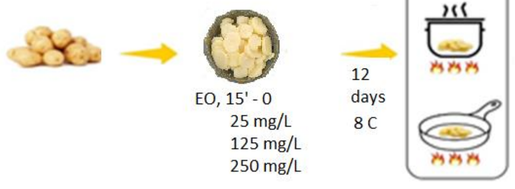
INTRODUCTION

Fennel essential oil antimicrobial activities against certain bacteria and microorganism in general are well documented in scientific literature[1,2].Fresh-cut potatoes (FCP), besides its suitability for use, are prone to the fast deterioration. Peeling and slicing made it susceptible to microbiological growth and undesirable color changes as well as the losing quality as a whole[3]. Therefore, among a lot of examined different techniques to prolong shelf-life of fresh-cut potato, using natural essential oils derived from certain plant species also attracts scientists attention especially when chemical preservatives are sought to be avoided[5]. Essential oils application in fresh-cut potato processing could also contribute to enrichment of potato aroma profile but could have negative impact on potato color, too[6].

OBJECTIVE

- The aim of this study was to investigate the effect of fennel essential oil (EO) treatment on the aerobic mesophilic bacteria count and color parameters of raw fresh cut potatos (FCP) as well as sensory properties of raw, and subsequentely boiled and fried FCP during 12 days storage at 8 °C.

MATERIALS &METHODS



Preparation
- Washing, peeling, slicing of potatoes cv. Birgit harvested in Slavonia region (Croatia) in 2020

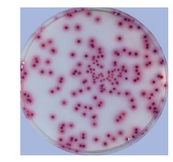
Essential oil treatment
- Dipping in water solution of fennel essential oil (EO) (0, 25, 125, 250 mg/L) 15 min with shaking

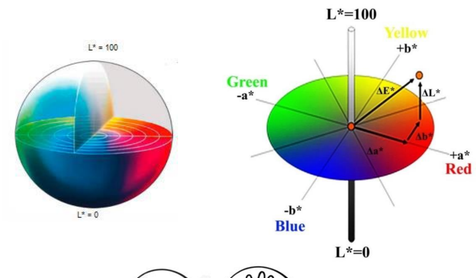
Storage
- Drained slices vacuum packaged in PE/PA bags[3]
- Storage for 6, 9 and 12 days at 8 °C

Thermal treatment
- Boiling: in distilled water at 100 °C/15 min[3]
- Frying: in sunflower oil at 140 °C/5 min

Analysis
- CIELab - redness/greeness - *a**[3] by colorimeter (Spectrophotometer CM-3500d, Konica Minolta, Japan)
- Sensory evaluation[3]: by 5 trained panelist, Quantitative Descriptive Analysis (scale 0 to 5). Color of raw and boiled, as intensity of browning (0=absent to 5=complete browning). Characteristic color of fried potato: 0=absent to 5=characteristic. Intensity of potato taste, fennel taste and off-taste: 0=absent to 5=very pronounced.
- Aerobic mesophilic bacteria count (AMB) by method HRN EN ISO 4833-1:2013 [4]

Statistical analysis was carried using two-way ANOVA (*p≤0.05).

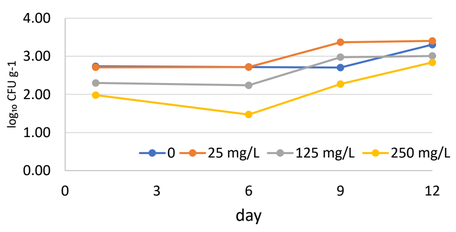




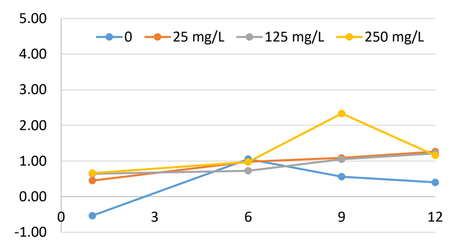
RESULTS & DISCUSSION

FENNEL ESSENTIAL OIL TREATMENT AND STORAGE OF FCP

AMB count (log_{10} CFU g^{-1}) in raw FCP before and after EO treatment and during storage



Color – *a** of raw FCP before and after EO treatment

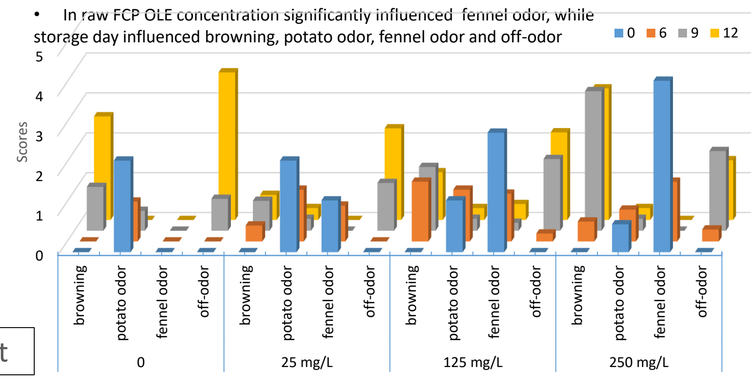


EO concentration AMB counts were lower, although after the 6th day an increase was observed for all concentration. EO treatment influenced all color parameters, but here is presented only *a** values which increased with EO concentration and storage day. Sensory evaluation showed that with increasing EO concentration certain attributes of raw and boiled FCP were altered, but not of fried FCP. With its increase more intense fennel odor of raw as well as browning, fennel odor and taste of boiled FCP were observed. Storage day had a more intense effect on sensory attributes than EO concentration. Storage day had a significant effect on almost all investigated attributes with exception e.g. fennel and sour taste of boiled FCP as well as and fennel odor and taste of fried FCP. Mentioned alterations could be linked to browning, off-odor, off-taste and sour taste increase, while potato- and fennel- odor and taste decrease.

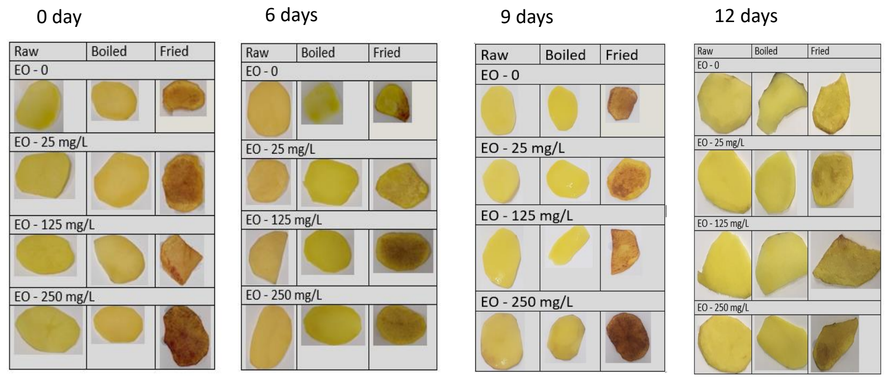
Sensory evaluation

Color and odor of raw FCP

- In raw FCP OLE concentration significantly influenced fennel odor, while storage day influenced browning, potato odor, fennel odor and off-odor

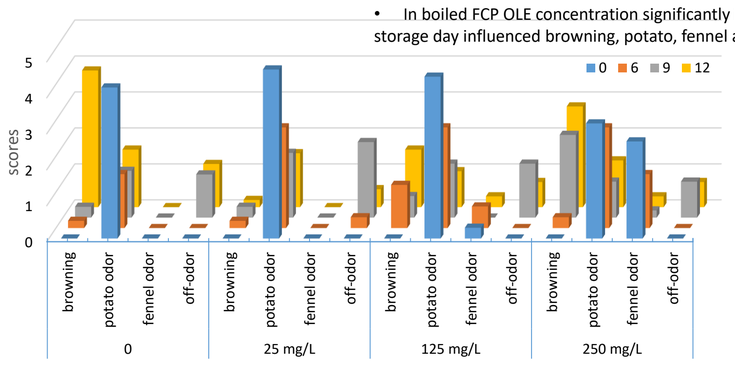


Images of FCP during experiment

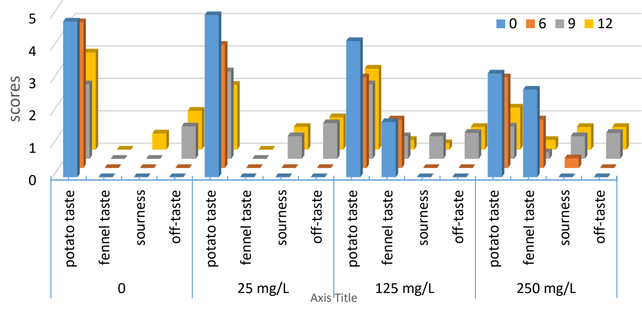


Color and odor of boiled FCP

- In boiled FCP OLE concentration significantly influenced browning, fennel odor and taste, while storage day influenced browning, potato, fennel and off-odor as well as potato and off-taste

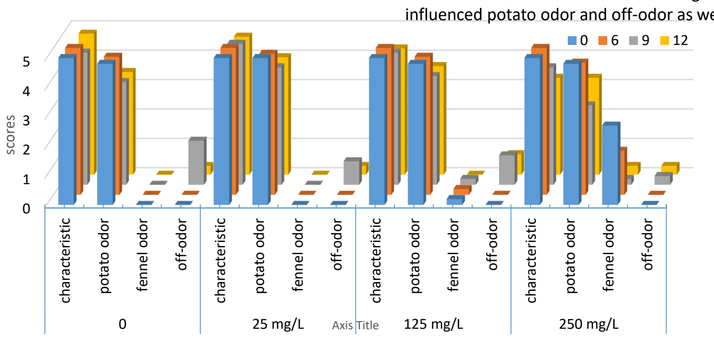


Taste of boiled potato

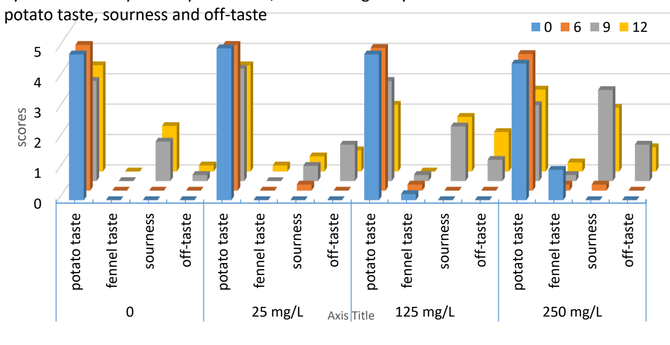


Color and odor of fried FCP

- In fried FCP OLE concentration didn't significantly influenced any sensory attributes, while storage day influenced potato odor and off-odor as well as potato taste, sourness and off-taste



Taste of fried FCP



CONCLUSION

Despite the antibacterial activity of EO, spoilage of FCP was not prevented during storage. In general, after 6 days, the best results, in terms of the absence of browning and off-odor of raw and off-taste and sour taste of boiled and fried FCP, with 25 mg/L EO treatment were obtained.

REFERENCES

1. *Anwar, F., Ali, M., Hussain, A. I., & Shahid, M. (2009). Antioxidant and antimicrobial activities of essential oil and extracts of fennel (Foeniculum vulgare Mill.) seeds from Pakistan. Flavour and Fragrance Journal, 24(4), 170-176.*
2. *Açıkgöz, M. A., Kara, Ş. M., Aruc, C., & Ay, E. (2017). Morphogenetic, ontogenetic and diurnal variability in antimicrobial activity of bitter fennel (Foeniculum vulgare Miller var. vulgare) essential oil. Indian Journal of Pharmaceutical Education and Research, 51(3), 190-194.*
3. *Dite Hunjek, D., Pranjić, T., Repajić, M., & Levaj, B. (2020). Fresh-cut potato quality and sensory: Effect of cultivar, age, processing, and cooking during storage. Journal of Food Science, 85(8), 2296-2309.*
4. *HRN EN ISO 4833-1:2013: Microbiology of the food chain — Horizontal method for the enumeration of microorganisms — Part 1: Colony count at 30 °C by the pour plate technique*
5. *Liu, X., Yang, Q., Lu, Y., Li, Y., Li, T., Zhou, B., & Qiao, L. (2019). Effect of purslane (Portulaca oleracea L.) extract on anti-browning of fresh-cut potato slices during storage. Food chemistry, 283, 445-453.*
6. *Luo, W., Tappi, S., Patrignani, F., Romani, S., Lanciotti, R., & Rocculi, P. (2019). Essential rosemary oil enrichment of minimally processed potatoes by vacuum-impregnation. Journal of food science and technology, 56(10), 4404-4416.*

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