POSIDONIA OCEANICA AND GREEN TEA EXTRACT AS ACTIVE AGENTS FOR SHELF LIFE EXTENSION OF FRESH CUT PEACH

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INTRODUCTION

Nowadays the reduction of food waste and the availability of food all over the world areas are priority keys for society. Shelf Life of fresh cut fruit can still be improved reducing physiological disorders and microbiological changes during storage. Often, shelf life extension of fruit is obtained by the use of natural extracts or commercial preparations (e.g. plant extracts, polyphenols mix, natural antioxidants, etc.). *Posidonia oceanica* (L.) Delile (typical seagrass of the Mediterranean sea) has a good content of phenolic compounds[1,2,3] used by the plant as a defense system against predators, competitors and pathogens[4]. Green tea extract is one of the most used compounds for food preservation[5], due to its antioxidant content.

RESEARCH OBJECTIVE

The aim of the present work was to extend the shelf life of fresh cut peach by dipping the slices with natural extracts from *Posidonia oceanica* (L.) Delile leaves (POS) and commercial preparation of green tea (GT). These preparations can be used to extend the shelf life of fruit such as peaches which are very appreciated fruit but they undergo to browning and quality decay during storage

MATERIALS and METHODS

***In vitro* analysis**
(on Green Tea commercial preparation (30% of polyphenols) and *Posidonia oceanica* (L.) Delile extract obtained from fresh leaves by Gokce & Haznedaroglu method[3])

- Total polyphenolic content (by Folin-Ciocalteu);
- Antioxidant capacity (by DPPH);
- Minimal Inhibitory Concentration (MIC) on: *Escherichia coli, Listeria innocua, Pseudomonas putida, Staphylococcus aureus, Saccharomyces cerevisiae, Aspergillus niger* and *Penicillium chrysogenum.*

***In vivo* analysis**
(on fresh cut peach, 'Richmay' cultivar)

- Total microbial count (TMC);
- Evaluation of colour;
- Total soluble solid (TSS);
- Titratable acidity (TA).

Peach slices were dipped with the two extracts (2% for POS and 1% for GT) for 2 min. The control (CTR) samples were dipped with distilled water. The slices were placed into low-density polyethylene (LDPE) bag and stored at 3 ± 1°C for up to 7 days. Analysis were carried out every 3 days.

RESULTS and DISCUSSION

In vitro

In function of the weight POS has an higher polyphenols content than GT (Figure 1). The DPPH assay showed the values of EC_{50} was 3.80 ± 0.11 mg/L for GT and 72.42 ± 22.90 mg/L for POS (Figure 2). The POS value is lower than other plant extracts even if of the same order. The higher polyphenols content of POS did not correspond to higher antioxidant capacity. This is caused by extractive process, that influences polyphenols quantity and quality and by the nature of the matrix. In fact, hydroxyl group next to methyl group means higher redox potential and lower antioxidant capacity, as in the case of polyphenols of *P. oceanica*, in comparison to di-hydroxyl and tri-hydroxyl phenols which are contained in the GT preparation.
Trials in vitro showed MIC values of above 2 g/L for POS and 1 g/L in GT mainly inhibiting Gram positive bacteria (Figures 3A and 4A/4B). POS was also found to delay the growth of certain fungi compared to the control up to approximately 72 h (Figure 3B).

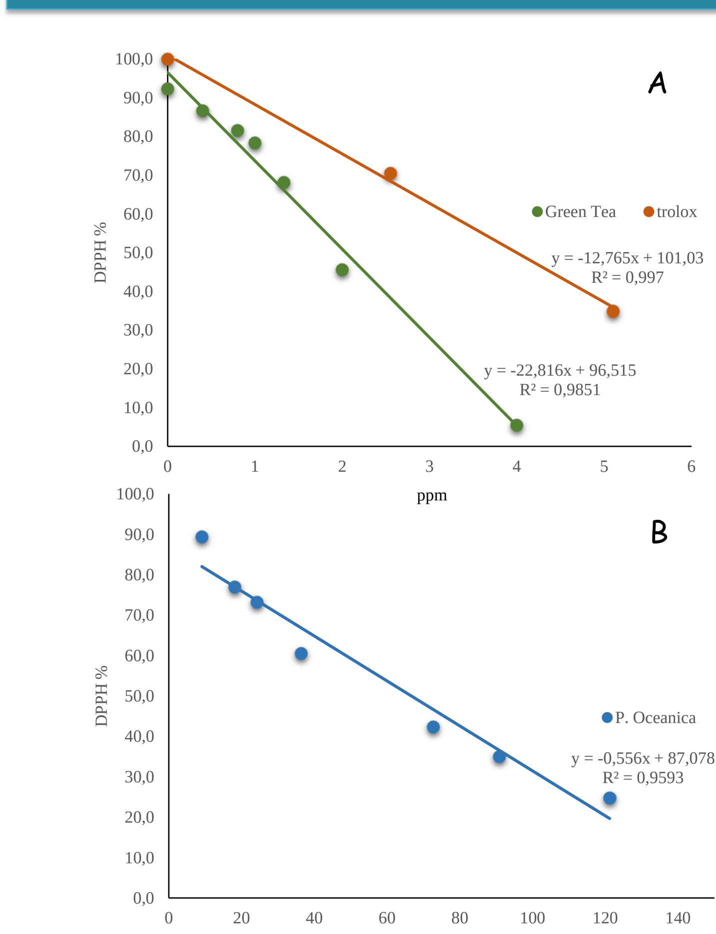

Figure 2. Antioxidant assay expressed as percentage of DPPH decay in (A) GT and Trolox, and (B) POS.

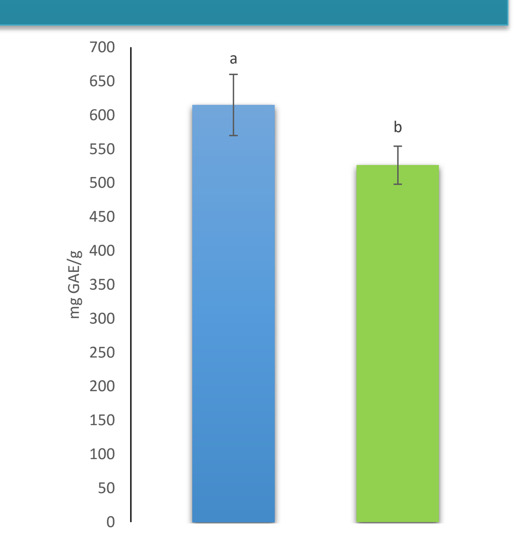

Figure 1. Total phenolic content of *Posidonia oceanica* (blue) and Green Tea (green) extracts. Data are the mean ± SE (n = 3) .

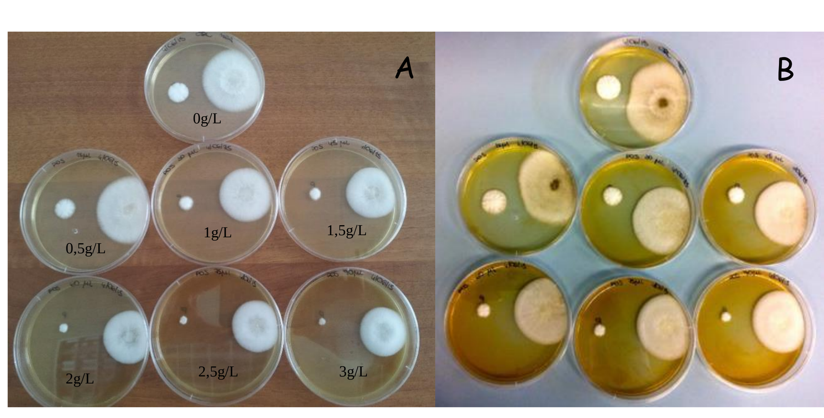

Figure 3. On moulds (in the plate: *Penicillium chrisogenum*, left; *Aspergillus niger*, right) MIC assay of POS at different concentrations of extract. A: after 2 days of incubation at 30°C; B: after 5 days, as we can see the lack of sporification in *A. niger*, from 1 g/L to up (colony on the right of Petri dish).

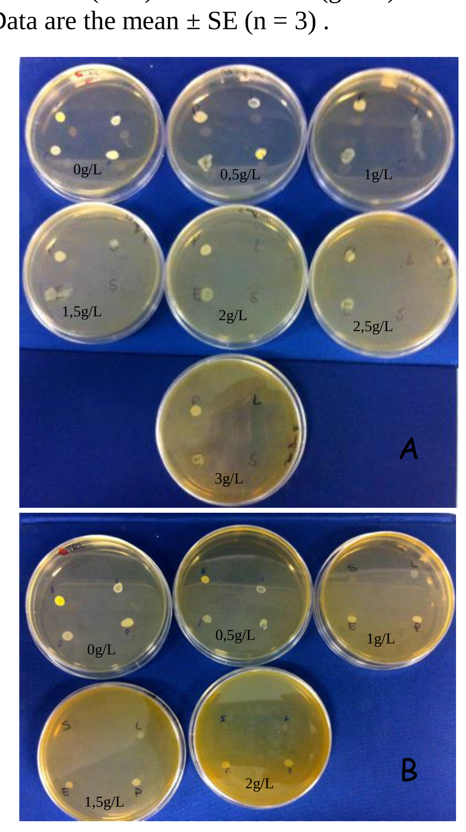

Figure 4. Bacterial MIC assay of POS (A) and GT (B) at different concentrations of extract. (strains: *Listeria innocua, Staphylococcus aureus, Escherichia coli, Pseudomonas putida*).

In vivo

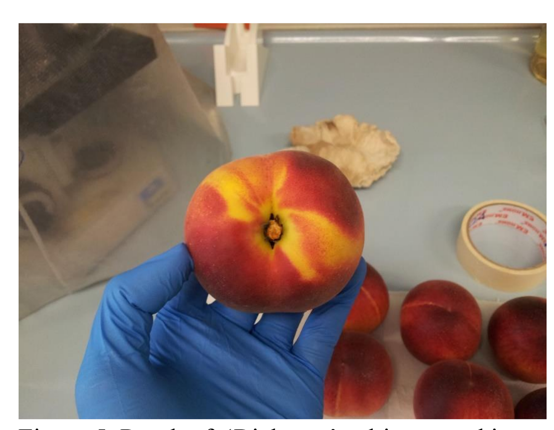

Figure 5. Peach of 'Richmay' cultivar, used in the experimental trial.

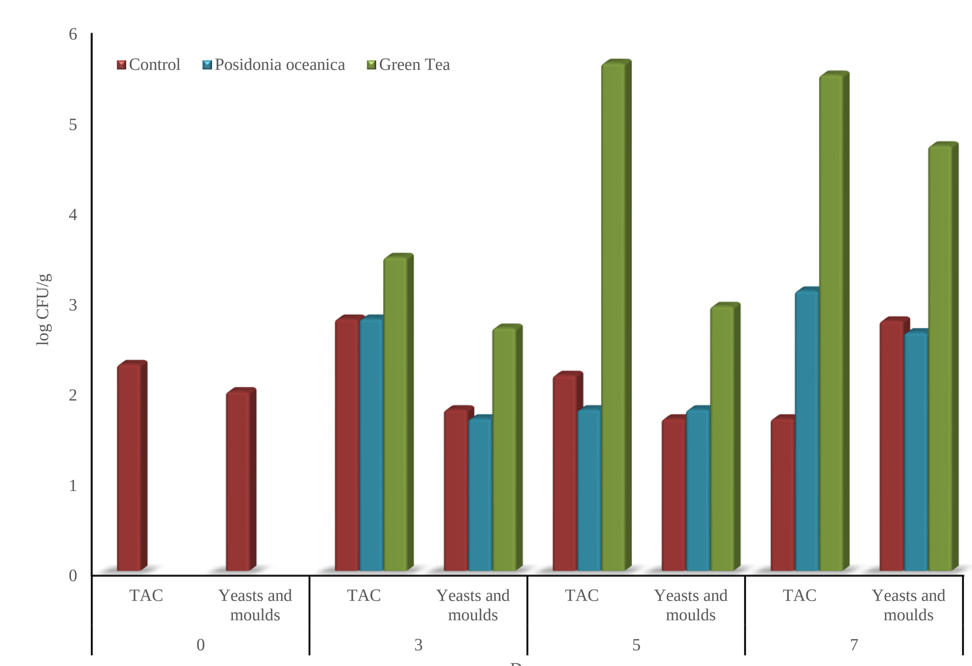

Figure 6. Total aerobic count (TAC) and Total yeast and moulds count of *Posidonia oceanica* (blue) and Green Tea (green) extracts compared to the control (red).

Treatment	Days	TSS (°brix)	TA (g/l)
DAY 0		10,35±0,87	3,00±0,1
CTR	3	10,90±0,01	1,97±0,1
	5	11,15±0,07	1,80±0,1
	7	11,80±0,01	1,10±0,1
POS	3	10,40±0,01	2,90±0,1
	5	10,55±0,07	2,80±0,1
	7	10,60±0,04	2,10±0,1
GT	3	9,20±0,08	2,49±0,1
	5	9,20±0,07	2,45±0,1
	7	9,20±0,01	2,40±0,1

Table 1. Total soluble solids (TSS) and tritatable acidity (TA) changes during storage of fresh cut peach. Data are the mean ± SD.

Treatment	Days	Lightness	Hue angle
DAY 0		59,63[aA]±0,85	68,04[aA]±0,41
CTR	3	56,01[bB]±1,51	68,80[aA]±0,35
	5	41,68[bC]±0,88	53,16[aB]±0,91
	7	38,35[bD]±1,49	39,53[cC]±0,21
POS	3	57,11[aA]±0,71	66,67[aA]±0,40
	5	48,24[aB]±1,40	50,27[aB]±0,51
	7	42,38[aC]±0,82	46,15[aC]±0,63
GT	3	54,08[cB]±0,86	55,28[bB]±0,72
	5	48,56[aC]±0,58	46,25[bB]±0,64
	7	44,89[aC]±0,81	41,44[bC]±0,59

Table 2. Lightness and Hue angle changes during storage of fresh cut peach. Data are the mean ± SE. Minor and capital letters show significant differences ($p < 0.05$) during storage among treatments for each storage time and for each treatment respectively.

Results related to the Total aerobic (TAC) and yeasts and moulds counts highlighted that peach slices dipped with POS maintained in 5 days of storage the microbiota at lower or similar levels as those found at t0 (For TAC POS shows 1.80 ± 0.09 log CFU/g in t5 respect 2.30 ± 0.11 log CFU/g of t0; for Y&M in t5 POS shows 1.80 ± 0.05 log CFU/g respect to CTR 1.70 ± 0.03 log CFU/g) (Figure 6).
The TSS content increased more in the control in comparison to the peach slices dipped with POS and it did not change by dipping with GT after 7 days storage (Table 1). At the same time, the decrease of TA was observed in all treatments but more rapidly in the control (Table 1).
Lightness and hue angle of peach slices decreased in POS, GT and rapidly in control, after 7 days storage (Table 2) .

CONCLUSIONS

In conclusion, *Posidonia oceanica* and green tea extracts were able to delay colour and pomological parameters decay, maintaining a good fruit quality during shelf life. Green tea extract and *P. oceanica* antimicrobial activity *in vitro* was not confirmed by *in vivo* analysis. *Posidonia oceanica* extract was more effective against moulds, delaying growth of fungi, the major responsible of fresh fruit deterioration. The dipping with the two polyphenol-based extracts seem to be suitable for the storage of fresh fruit as extending its shelf-life.

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