INTRODUCTION
Green tea (GT) is a high source of polyphenols such as epigallocatechin gallate, epicatechin gallate, and epicatechin. Beside their antioxidant properties, these polyphenols show pharmacological activities and their consumption has been correlated with low incidence of chronic pathologies related to oxidative stress. The GT amount that must be consumed daily to obtain the aforementioned health benefits is quite high and difficult to achieve. In this context, the production of food products fortified with GT (OTE) can help to reach the intake of GT polyphenols capable of exerting beneficial effects on human health. Nutritional fortification with GT extract was studied in bakery products such as bread and biscuits, noodles, probiotic yogurt, frozen surimi gel, in dried and minimally processed apples (Tappi et al., 2017). However, the addition of GT to food products can affect their physical and sensory characteristics (e.g. colour) thus the enrichment with GT can not be assessed only depending on the desired polyphenols fortification degree but it must be performed taking into account side effects exerted by these components on the quality attributes of the food product.

AIM:
To investigate the use of green tea extract for the production of frozen carrots fortified with GT polyphenols. In order to limit quality loss induced by processing and frozen storage and to produce high quality frozen products, carrots were enriched also with trehalose. The solution penetration into the vegetable was performed by using, as freezing pre-treatments, blanching in combination with vacuum impregnation.

RESULTS

TREATMENT ENVIRONMENT

Both blanching and vacuum impregnation pre-treatment allowed to effectively enrich the stored carrots with trehalose.

COLOUR

BL and VI pre-treatment determined a slight increase in hue.

FIRMNESS

 Blanching significantly improved the carrots’ firmness. BLw+VI samples evidenced a higher firmness compared to the other pre-treated samples. Freezing and frozen storage negatively affected the carrots’ firmness.

ANTIOXIDANT ACTIVITY

 Blanching in trehalose solution and VI treatment with green tea extract slightly affected the quality properties of carrots and allowed to increase considerably the carrots’ functional properties and to preserve the firmness of the plant tissue. Trehalose showed a protective effect on the physical properties of the frozen samples only when its addition occurred by Blanching.

After freezing and frozen storage all the samples evidenced a significant loss of carotenoids while the total polyphenol content was preserved only on carrots previously fortified with green tea polyphenols. Despite these variations, blanching and vacuum impregnation in green tea extract allowed to obtain after 60 days of frozen storage carrots with an antioxidant activity doubled compared to the fresh vegetable.

CONCLUSION

 Blanching in trehalose solution and VI treatment with green tea extract slightly affected the quality properties of carrots and allowed to increase considerably the carrots’ functional properties and to preserve the firmness of the plant tissue.

Trehalose showed a cryoprotective effect on the physical properties of the frozen samples only when its addition occurred by Blanching.

After freezing and frozen storage all the samples evidenced a significant loss of carotenoids while the total polyphenol content was preserved only on carrots previously fortified with green tea polyphenols. Despite these variations, blanching and vacuum impregnation in green tea extract allowed to obtain after 60 days of frozen storage carrots with an antioxidant activity doubled compared to the fresh vegetable.

REFERENCES


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M&M

MATERIALS. Organic carrots (Daucus carota, cv. Romance) were selected (i.e. length of 18-20 cm and diameter of 1.5-2.0 cm), washed, peeled and cut in 0.5 cm thick slices. Green tea (Camellia sinensis) powder extract (OTE) was purchased from HerbaPharma s.r.l. (Republic of San Marino) while trehalose from Abiko s.r.l. (Kussharo, Japan).

SAMPLES PREPARATION: Carrot slices were blanched in water (80°C) for 4 min and then frozen at -18°C for 10 days. Vacuum impregnation was carried out on BLw or BLw+VI samples by using as impregnant agent water (W), trehalose 10% w/v (T), green tea extract 0.025% w/v (TE) or trehalose 10% w/v in combination with green tea extract 0.025% w/v (T-E). After pre-treatments, samples were packed in 400 BP bags (Film thickness: 30 μm) in air, frozen at -60°C and stored at -18°C up to 60 days.

STATISTICAL ANALYSIS: data were reported as mean and standard deviation and additionally analyzed by ANOVA. Significant differences between means were calculated by LSD test at a significance level of 0.05. Data were processed using the STATISTICA for Windows (StatSoft®, Tulsa, OK) software.

Fig.I. Total polyphenol content of carrots treated with pre-treated carrots before (T0) and after freezing and frozen storage for 60 (T60) days.

Fig.II. Total polyphenol content of not pre-treated and pre-treated carrots before (T0) and after freezing and frozen storage for 60 (T60) days.

Fig.III. Total polyphenol content of not pre-treated and pre-treated carrots before (T0) and after freezing and frozen storage for 60 (T60) days.

Fig.IV. Total polyphenol content of not pre-treated and pre-treated carrots before (T0) and after freezing and frozen storage for 60 (T60) days.

Fig.V. Total polyphenol content of not pre-treated and pre-treated carrots before (T0) and after freezing and frozen storage for 60 (T60) days.

Fig.VI. Antioxidant activity of not pre-treated and pre-treated carrots before (T0) and after freeze drying and frozen storage for 60 (T60) days.

Fig.VII. Antioxidant activity of not pre-treated and pre-treated carrots before (T0) and after freeze drying and frozen storage for 60 (T60) days.

Fig.VIII. Antioxidant activity of not pre-treated and pre-treated carrots before (T0) and after freeze drying and frozen storage for 60 (T60) days.