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Tarragon extract as a functional ingredient for development of new pizza dough

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Introduction

Plants are used in various fields due their sensory, nutritional and medicinal properties, and aromatic plants can be used as functional food ingredients to enhance organoleptic properties and/or to replace the salt. Additionally, their large amount of bioactive compounds, namely phenolic compounds (PC), can contribute to food preservation, promote human health (Costa et al., 2015), and provide bioactive effects. Tarragon, *Artemisia dracunculus* L., usually known for its pleasant spicy aroma, is widely used in food preparations (Hassanzadeh et al., 2016). In this work, a lyophilized hydroethanolic tarragon extract was characterized in terms of PC and bioactive properties, such as antioxidant, antimicrobial and cytotoxic activities and further used to develop functional foods namely by its incorporation in pizza dough.

Materials and Methods

Dried tarragon was kindly offered by "Cantinho das Aromáticas" (Vila Nova de Gaia, Portugal). The extract was obtained by maceration using 1 g of the powdered sample and 30 mL of an ethanol:water mixture (80:20, *v/v*). The PC were analyzed by HPLC-DAD-MS and the antioxidant activity by DPPH radical scavenging activity, reducing power (RP), inhibition of β-carotene bleaching and lipid peroxidation inhibition. The cytotoxic properties were evaluated in human tumor cell lines (breast, cervical, hepatocellular and non-small lung carcinoma) and in non-tumor cells (porcine liver primary cell culture) by the sulforhodamine B colorimetric assay. Antibacterial and antifungal activities were evaluated against 11 bacteria and 8 fungi species. Pizza dough was prepared using 250 mg of tarragon extract per 125 g of fresh or baked dough. For each type of pizza dough, two controls (one without the extract and another with 250 mg of ascorbic acid (E300), a commonly used commercial antioxidant) were prepared. The PC profile and the antioxidant activity (DPPH and RP) of the final products were assessed immediately after preparation and after 5 days of storage at 4°C. More details are provided in Ribeiro et al. (2016).

Discussion

Eight PC were identified and quantified in the hydroethanolic tarragon extract: 7 phenolic acids

and 1 flavonoid. However, a ferulic acid hexoside was the most abundant molecule, followed by rutin and 5-O-caffeoylquinic acid, and represent 33.7±0.3, 31.90±0.03 and 23.8±0.1 mg/g of the extract, respectively. In terms of antioxidant properties, the tarragon extract revealed different EC_{50} values (concentration responsible for 50% of antioxidant activity) in the performed assays; the highest potential of the extract was found as a reducing agent (155±1 μg/mL). The tarragon extract also demonstrated ability to inhibit the growth of tumor cell lines, mostly the cervical carcinoma cell line (HeLa), and the extract did not show any toxicity for non-tumor cells. The extract showed a broad antimicrobial activity against microorganisms with relevance for public health and food contamination. Methicillin resistant *Staphylococcus aureus* (MRSA), *Listeria monocytogenes*, *Pseudomonas aeruginosa* and *Escherichia coli* were the most sensitive bacteria, while *Aspergillus fumigatus*, *Trichoderma viride*, *Penicillium funiculosum*, *Penicillium ochrochloron* and *Penicillium verrucosum* the most susceptible fungi.

After incorporation of the extract in fresh and backed pizza dough, the amounts of PC were monitored. Both fresh and baked dough incorporated with the tarragon extract present similar profiles as the extract itself, mainly in terms of ferulic acid and rutin. As expected, the controls did not revealed PC. In terms of antioxidant properties, the dough incorporated with E300 showed the highest antioxidant capacity. However, the dough supplemented with the tarragon extract displayed improved capacity comparatively with the control and the various molecules present in the extract may have synergistic effects with other antioxidants and can contribute to other bioactive effects.

Conclusion

Tarragon extract can be considered as a potential food additive, preventing food spoilage and contamination, replacing synthetic additives widely used in the food sector. Further studies with the tarragon hydroethanolic extract are needed in order to understand its complete role and also to define the best conditions to be used. This work complements a similar potential of the rosemary extract, already allowed in Europe, as a natural antioxidant for the food industry.

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