Study of Structure-Property-Process relations in real functional FOODs

Berichterstattung

Projektinformationen

FOODSPPROCESS

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Projekt abgeschlossen

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Final Report Summary - FOODSPPROCESS (Study of Structure-Property-Process relations in real functional FOODs)

In the context of current economic and social changes, the research in the agri-food area should aim, among other things, to the optimization of products and processes. The improvement of the food products must be directed towards ensuring nutritional and specific functional benefits. Regarding the improvement

of processes, they should ensure the quality and safety of environmentally friendly food products produced optimizing the use of resources.
A research activity focused on fundamental analysis of the structure-property-process and directed towards the innovation and technological improvement of the processes so that the results can be used directly by the agri-food companies will help to achieve these challenges.
The overall goal of this work has been to go in-depth on the study of any type of interactions that can be established between trehalose, antioxidant activity compounds, probiotic microorganisms and cellular structure of fruits determining the effect of homogenization pressures and drying temperatures in these interactions, for the technologically improvement of process and functionality of two groups of innovative natural functional foods with antioxidant and/or probiotic effect:
- Natural juices
- Dehydrated fruits that include the functional juice in their own structural matrix.
Raw materials used for the development of functional food have been:
1. Mandarin juice (cv. Ortanique) is widely used and consumed all over the world, its beneficial properties are well known. The Ortanique cultivated variety is very reach in flavonoids content.
2. Apple (cv. Granny Smith) is widely consumed all over the world; its high porosity ensures an impregnation of at least 20 %. This cultivated variety is very easy to find in supermarkets with quite constant physico-chemical properties during all the year.
3. Trehalose. Disaccharide to be used due to its protective properties.
4. Probiotic microorganism (Lactobacillus salivarius spp. salivarius) with effect against Helicobacter pylori infection.
Process operations used in the technological studies have been:
a. Dynamic high pressure homogenization;
b. Vacuum impregnation;
c. Hot air drying.
The vacuum impregnation of a fruit or vegetable porous structure permits the preparation of a fortified functional food without subjecting the product to high temperatures. For this aim, high pressure homogenization can improve the technological and functional characteristics of the liquid media introduced into the porous structure. Finally, drying technologies allow obtaining a product with a long shelf life and specific structural features.
The study of the effects of these technologies, alone or in combination, on the bioactive compounds of the products in which they are applied is very interesting. Particularly it is noteworthy to take into account the influence of product structure changes on this effect.

Figure 1. Schematic representation of the possible interaction/combination of high pressure homogenization, vacuum impregnation and drying technology for the preparation of different functional products, and possible effects on product quality (Betoret et al., 2015).

Related to fruit juices with antioxidant effect, the project results showed that the application of homogenization pressures better maintains the physico-chemical characteristics of mandarin low pulp juices, together with trehalose addition, that demonstrated a bigger preservation on antioxidant compounds in treated juices.

In probiotic mandarin juices, the application of homogenization pressures affected the juice structure and allowed obtaining the an high quantity and a more stable probiotic microorganisms. The capacity of digestive system colonization by probiotic microorganisms and its effectivity against helicobacter pylori infection was affected by the food matrix and increased with both homogenization pressures and trehalose addition.
The different levels of homogenization pressures applied as well as the levels of trehalose were able to modify the impregnation capacity of apple, obtaining in all cases a high quality fresh like minimally processed product with probiotic or antioxidant effect.
The different temperatures applied during drying operation together with trehalose addition allowed optimizing the operation, determining the water distribution and the final texture of the developed snack. In all cases the obtainment of a snack with probiotic or antioxidant effect was possible, with a qualitative stability of at least 3 weeks.
In this project, the interactions between trehalose, antioxidant compounds, probiotic microorganisms and the cellular structures of fruits have been assessed. The process operations mentioned above have been studied, making possible the understanding of the changes in the food products and its relation with the created structures. Technological solutions directly transferable to the industry have been addressed in order to increase the functional effect on the final products and to provide a real alternative to the development of both antioxidant and probiotic functional foods from natural juices or from fruits. The functional foods developed and studied in this project can help to improve or prevent some diseases with high prevalence in the society, thus directly influencing the public health and contributing to the global sustainability.
Moreover, the research project promoted the collaboration among researchers from different countries with different scientific skills facilitating to create a multidisciplinary network, that will contribute to improve the basic food science and the applied food engineering research in the European Union.
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Verwandte Dokumente

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