Encapsulation of natural flavors for use in dairy products

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ABSTRACT:
Several aromatic plants, e.g. Coriandrum sativum, Ocimum minimum, Petroselium sativum, Pterospartum tridentatum, belong to the characteristic mediterranean flora, and are accordingly employed in Portuguese gastronomy since ancient times to improve flavor and reduce the need of salt. The main objective of this work through the development of different food products, more attractive and enjoyable than the classical equivalent, and that complement their intrinsic nutritional value with new areas relevant to the functional health, as is the increase in antioxidant activity. The products chosen were three dairy products, including fresh cheese, cheese spreads and butter, taking into account the practical experimental pilot scale available on the ESAC. The modification of these three products has primarily by the addition of natural aromatic compounds (Coriandrum sativum, Ocimum minimum and Petroselium crispum), has demonstrated not only by the Portuguese taste acceptability, but also taking into account their potential antioxidant and antimicrobial activity. Those flavorings have been added to dairy products in two forms: the form of fresh plants, grown in ESAC, washed, disinfected and shattered into pieces roughly the size controlled, and the form of essential oils extracted (Clevenger) from plants. The incorporation of plant parts in those dairy products, with a distribution as good as possible not to affect the rheological characteristics of each final product was achieved at a processing step in which the consistency of the product in itself, helped to retention of additives vegetables. The addition of essential oils went by her imprisonment in microcapsules, in particular by using cyclodextrins. The final product quality will be preliminarily assessed by sensory analysis, through a panel of untrained tasters.

Keywords: Aromatic plants, encapsulation, cyclodextrins, dairy products, sensory analysis.

1. INTRODUCTION
Over the years, the lifestyle has undergone considerable changes. From the standpoint of food, it is known that the time spent preparing meals is markedly reduced. Allied to this situation, we found consumers are increasingly demanding about the quality and diversity of products looking to see associated flavor and properties (biological properties: antioxidant, antimicrobial) that contribute to their health and quality of life.

Many flavor components are volatile which are susceptible to loss by evaporation, oxidation or ingredient interactions. As a result, it is beneficial to encapsulate the volatile flavors prior to use in foods. Encapsulation can be defined as any method employed to entrap a flavor in a carrier to convert it to a more useful form or to impart some degree of protection against evaporation, reaction or oxidation in food (Edris, A. and Bergström, B., 2001). Of the different types of encapsulation methods (coacervation, extrusion, spray-drying, multiple emulsions, molecular inclusion, etc.), the use of cyclodextrins (method of molecular inclusion), has arouse great interest in the scientific community, both in terms of research as the field of applied technologies (ingredients of drugs in food or cosmetics). β–Cyclodextrin (β-CD) is a short, hollow, truncated cone shaped molecule, which is formed by seven α(1-4) linked gluco-pyranoses in normal chair conformations (Silva et al, 2007) β–CD is widely utilized in food and pharmaceutical industries to encapsulate compounds that are sensitive to the environment, have a slow solubility in water and high volatility.

Escola Superior Agrária de Coimbra (ESAC) - Instituto Politécnico de Coimbra, Portugal, has a Dairy homemade. In this sense, the fresh aromatic plants and the essential oils encapsulated were applied to some products produced there like fresh cheese, spread cheese and butter. Sensorial analyses were made to avail the receptivity of the consumer to these products.
2. MATERIAL AND METHODS

2.1. Plants obtention

The plants: parsley (*Petroselium crispum* var. *laitifolium*), Coriander (*Coriandrum sativum* var. *microcarpum*) and bush basil (*Ocimum minimum*) were obtained in ESAC fields.

2.2. Essential oil extraction

Fresh leaves of coriander, parsley and bush basil were subjected to hidrodestyllation in a Clevenger apparatus coupled a microwave in a minimum of twenty minutes. The essential oils of parsley and coriander were obtained in a yield of 0.05% (w/w) and the essential oil of bush basil was obtained in a yield of 1%.

2.3. Evaluation of total antioxidant capacity

The assessment of total antioxidant capacity was determined by ABTS•+ (Gião et al, 2007), with modifications (evaluation of antioxidant activity in essential oil). This method is based on the decolorization of the radical cation ABTS•+, measured as percentage inhibition after spectrophotometer readings at 734 nm.

In order to obtain an absorbance value (Abs) between 680 nm and 720 nm at a wavelength of 734 nm proceeded to the dilution of ABTS•+ solution in ultra-pure water. Each experimental sample was added to 1 mL of ABTS•+, using such volume (10 mL), which after 6 minutes of reaction the percentage of inhibition is between 20 and 80%. Measurement (oil dissolved in a mixture 50:50 (ethanol: toluene) was performed in triplicate, with the final value was the average of three replicas. The total antioxidant capacity was expressed as percentage inhibition (PI), according to the equation PI = ((ABTS•+ Abs - Abs sample) / Abs ABTS•+) × 100 where Abs ABTS•+ is the initial absorbance of diluted ABTS•+ and Abs sample the absorbance of the sample after 6 minutes of reaction. The calibration curve was prepared in parallel using standard solutions of ascorbic acid at various concentrations and under the same experimental conditions. The final results are expressed as equivalent grams of ascorbic acid per liter of sample (g/L).

2.4. Preparation of inclusion complex of β–cyclodextrin with essential oil

The inclusion complex of cyclodextrins powders was prepared in a glass beaker. The β-Cyclodextrin (KLEPTOSE, was kindly offered by Roquette, France) was weighed and mixed with distilled water. After dissolution, essential oil was added. The solution was mixed by magnetic stirrer and stirred at 35 °C for 1 h. The solution was cooled to refrigerate temperature for 24 h. The precipitate was dry at room temperature.

3. RESULTS AND DISCUSSION

3.1. Evaluation of total antioxidant capacity

The value of total antioxidant activity of coriander essential oil equivalent of ascorbic acid ranges from 0.025 ± 0.002 g/L, between 0.019 ± 0.002 g/L for the essential oil of parsley and 0,022 ± 0.002 g/L for the essential oil of bush basil.

3.2. Sensorial Analysis

Fresh cheese and spread cheese with essential oils encapsulated have been preferred in respect products that were added fresh plants. Butter with encapsulated and with fresh plants was also accepted.
4. CONCLUSIONS
- Fresh cheese and spread cheese with essential oils encapsulated have been preferred in respect products that were added fresh plants.
- Butter with encapsulated essentials oils and fresh plants was also accepted.
- The extracts- essential oil with cyclodextrins prepared (“powder”) were easily homogenized in the food product, but with fresh plants uniform size of plants and a provision in homogeneous products has not been achieved.

5. REFERENCES