Editorial

Application of nanotechnology for optimization of bleaching efficiency of edible oils

Abstract

Nanotechnology is the recent science dealing with materials at the nano-sized (smaller than 100nm). Nanotechnology showed its potential significance in almost all industrial sectors. In the current paper, the potency of nanotechnology was affirmed in the food science and technology, especially in the manufacturing of edible oils which passes many procedures, from which is the most important step of bleaching edible oils to remove colorants and contaminants and enhance the quality parameters of these vital components of the human diet. Bleaching process made use of bleaching earth powder which was converted into the nano-sized and then utilized in the bleaching process of edible oils. Results showed the powerful bleaching efficiency optimized by applying nanotechnology in converting the bleaching earth powder to the nano-sized through mechanical milling processes which resulted in smaller size in nanoscale with more efficient surface area available for adsorption of colorants and contaminants of the edible oils resulting in pure edible oils of superior quality and safety.

Keywords: edible oils, bleaching efficiency, nanotechnology, optimization

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Rania IM Almoselhy
Oils and Fats Research Department, Food Technology Research Institute, Agricultural Research Center, Egypt

Correspondence: Rania IM Almoselhy, Oils and Fats Research Department, Food Technology Research Institute, Agricultural Research Center, Egypt, Email rania_almoselhy@outlook.com

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Introduction

Nanotechnology in food science

Nanotechnology is the management of materials or systems at the nanometer scale or smaller than 100 nm, where novel properties emerge compared with macroscale materials, and a high surface-to-volume ratio resulted in new properties of the system which has been applied to improve food quality.[1]

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Bleaching of edible oils

Bleaching is a physicochemical process that involves the treatment of degummed oil with normal bleaching earth powder in definite ratios on a weight basis between the edible oil and the bleaching powder, so that many colorants and contaminants were removed with the resulting bleached oil of light color and high quality.[2]

Mechanical milling of the raw bleaching earth powder

The raw bleaching earth powder (Engelhard F160 bleaching earth, USA) was milled in a planetary ball mill of 12 mm diameter balls with a ratio 15:1 between the ball and powder weight, for about 10 h. To monitor the morphology and particle size of the raw bleaching earth, a transmission electron microscope (TEM) was employed. Also, X-ray diffraction (XRD) analysis was done for the crystalline size and lattice strain. The change in crystal size (66.41-28.94 nm) and lattice strain (0.2085-0.4785%) were observed.[3]

Bleaching edible oils with the nano-sized bleaching earth powder

Edible oils (Soybean, corn, and sunflower) were bleached with the milled nano-sized bleaching earth powder, and the bleaching efficiency was calculated by the difference between the colors of crude and bleached oil divided by the color of crude oil. The bleaching efficiency for nano-sized bleaching earth was more than twice its value for the normal bleaching earth. Also, peroxide values and spectral absorbencies at 232 and 270 nm proved the aforementioned color results.[3]

Extra virgin olive oil as an example of edible oils used without bleaching

Extra virgin olive oil (EVOO) is extracted only by cold pressing in a mechanical procedure without solvent. This cold pressed olive oil has superior physicochemical quality characteristics (compared with other edible oils extracted by the solvent) as a valuable component of Mediterranean (MED) human diets, and has been used for many nutritional and medicinal purposes. EVOO is used in therapeutic nutrition during the COVID-19 pandemic, as EVOO contains powerful antioxidants that can help in the reduction of the oxidative stress that leads to a variety of diseases and conditions that increase the risk for serious cases of COVID-19.[4] This naturally extracted cold pressed oil is used as it is without further refining or bleaching processes. It does not contain the processing contaminants such as 3-monochloropropanediol (3-MCPD) at quantifiable levels, knowing that 3-MCPD is a heat-induced contaminant formed during the refining process of edible oils processed under high temperatures, and occurs mainly during the deodorization step. EVOO is considered the most important oil which makes some of the manufacturers involved in criminal adulteration of this oil and this was followed by many regulations and physicochemical procedures to confirm the authenticity, identity, and quality parameter of EVOO with many methods such as UV-visible, FTIR spectroscopy, ^{1}HNMR, DSC.[5–12]

Innovations in edible oils technology

New technologies have been used to enhance low-quality olive oil to fit human consumption with high amounts of polyphenols, oleic and linoleic acids.[13,14] Edible oils can be blended with pomegranate or garden cress seed oils, up to 60% for blending with pomegranate oil and 50% for garden cress oil to be a potential alternative and non–conventional seed oil source for omega–3 and omega–5 fatty acids.[15]

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Conflict of interest

The author declares no conflict of interest.

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