



Opinion

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# Mediterranean Diet and Food Technology: Sustainable Strategies for A Globalized World



Betoret N\* and Betoret E

<sup>1</sup>Instituto Universitario de Ingeniería de Alimentos para el Desarrollo, Universitat Politècnica de València, Spain

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\*Corresponding author: Betoret N, Instituto Universitario de Ingeniería de Alimentos para el Desarrollo. Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia, Spain E-mail: noebeval@tal.upv.es

## Abstract

Mediterranean Diet has been widely studied and its nutritional, healthy, and sustainable benefits have been recognized. However, in the last decades, globalization has brought about major changes in the developed world and a progressive deviation from the main Mediterranean patterns. Fresh food and traditional recipes continue to be valued and their beneficial effects on health are scientifically proven. Despite this, they have been largely replaced by fast and ...less nutritious food. Is it... possible to perform alternatives and procedures that help us to mitigate some deviations from the Mediterranean Diet, contributing to a more right, sustainable, and nutritious food system in a globalized world? This communication reinforces the idea that food technology and scientific advances must be properly applied to meet the challenges faced by Mediterranean countries.

**Keywords:** Mediterranean Diet; Food functionality; Sustainability; Consumption patterns; Food technology

## Introduction

Mediterranean Diet implies not only the intake of certain foods but also a lifestyle with consumption patterns and relationship with the environment, that has been transmitted from generation to generation. It has been widely studied and its nutritional, healthy, and sustainable benefits have been proven. Its recognized global value meant the recognition of the Mediterranean Diet as Intangible Cultural Heritage of Humanity by the UNESCO Intergovernmental Committee in 2009 [1]. Moreover, it was recognized in 2019 as a possibly universal model of healthy diet from the EAT-Lancet Commission [2]. Regarding the food diversity, its processing and culinary procedures, the main nutritional, and sustainability advantages mainly derive from:

- a. The use of crops and varieties adapted to local conditions. The growth of a wide variety of fruits, vegetables, cereals, and legumes prevails, and a wide heritage of ancient varieties have been preserved.
- b. Fruits and vegetables are harvested at the optimum maturity, taking advantage of the maximum nutrient content. This fact is linked to a lifestyle in which social values and the care for the land and the environment predominates.
- c. Fruits, vegetables, cereals, legumes, meat, and fish are integrated and combined in traditional recipes that complement

nutrients and are cooked using simple techniques such as simmering, baking, dehydration, and fermentation. Mediterranean culinary system is part of the Mediterranean lifestyle and consumption patterns.

However, in the last decades there have been worldwide important changes that have brought with them a progressive deviation from the main Mediterranean patterns. The high population density in the cities and the depopulation of rural areas have reduced the availability of plant-food and increased the consumption of animal protein above the amounts needed for a proper nutrition. International companies have emerged increasing food availability around the developed world and the globalization of markets has occurred. The economic interests of large companies prevail over the reduced familiar economy. Consequently, it is no longer harvested at the optimum maturity since the food needs to withstand transport and distribution and reach the consumer in good condition. A huge number of residues are generated. Families no longer have time to cook traditional dishes while companies have technology to produce tasty dishes. Nevertheless, traditional recipes continue to be valued and their beneficial effects on health are recognized more and more. Sustainability and functionality of food are sacrificed and climate change and non-communicable diseases (obesity,

diabetes, hypertension...) are exacerbated. An environmental, social, and nutritional alarm is created while the technological revolution reaches its highest levels. In this context, governments implement actions to prevent disasters without harming the patterns of economic development achieved by rich countries. It is promoted the consumption of vegetable proteins to reduce the emission of greenhouse gases; the consumption of foods with bioactive components with a health benefit; the reduction and valorization of waste and circular economy; the use of green and alternative technologies energy efficient, without effluents or chemicals. In addition, strict food regulations are established ensuring the highest levels of quality and safety ever achieved, but marked by abuses committed in the past, consumers increasingly distrust the food industry. Governments supported by scientific and technological development must find solutions to current challenges in a globalized world in which the recovery of social values and the integration with the natural environment requires combining Mediterranean values with economic development. Local agriculture and biodiversity must be promoted, and the social and cultural aspects must be respected. But is it possible to perform alternatives and procedures that help us to mitigate some deviations from the Mediterranean Diet, contributing to a more right, sustainable, and nutritious food system in a globalized world? This communication reinforces the idea that food technology and scientific advances must be properly applied to meet the challenges faced by Mediterranean countries.

### Technology and Food Functionality

The technological and scientific revolution of last decades has not only provided safer foods with higher quality, but it has also allowed us to learn much more about the relationship among structural, compositional, and physicochemical characteristics of foods, the effect that processes have on them and their physiological use by the human organism [3]. This technological revolution is being properly used by many companies, which are very conscious of social and environmental problems. For example, certified B Corporations are a new kind of business that balances purpose and profit. They are legally required to consider the impact of their decisions on their workers, customers, suppliers, community, and the environment. This is a community of leaders, driving a global movement of people using business as a force for good.

Nutritional and healthy effect of food is determined by its content in macro and micronutrients, their release at the target site in the adequate form and its suitable assimilation. These three aspects considered together define the functionality of a food and are reflected separately in digestibility, bio accessibility and bioavailability concepts. Nutrient bio accessibility is defined as the amount of the nutrient that is released from the food matrix and become available for absorption in the systematic circulation through the gut wall. Nutrient bioavailability considers the total amount of the nutrient that is released and absorbed to reach the bloodstream where it is delivered to the different body tissues.

Besides them, digestibility applies specifically to the fraction of food components that is transformed into potentially accessible matter through all physical and chemical processes that take place in the lumen. Moreover, recently, the influence of nutrients in biochemical pathways through secondary metabolites produced by gut microbiota seems to be decisive in their healthy effect [4]. It is clear that fresh foods at optimum maturity have the highest content of nutrients and bioactive components but processing, especially heat treatments, decrease their content. However, in many fresh foods there are antinutrients or combinations of components that significantly decrease its nutritional value or may even make its intake unsafe. For example, phytic acid, lectins, phenolic compounds (tannins), saponins and enzyme (amylase and protease) inhibitors have been shown to reduce the availability of nutrients and cause growth inhibition, while phytoestrogens and lignans have been linked with infertility problems. Poor nutritive value of the food legumes is due to the presence of tannins that inhibit the digestibility of protein and phytic acid reducing the bioavailability of some essential minerals [5]. The case of iron is one of the most studied; bioavailability of iron is not only a question of its content, but also whether it is plant or animal derived and whether other biochemical factors are present within the food matrix [6]. In recent years, numerous studies have shown that the functionality of a food can be maintained and even increased with the application of simple technologies such as drying or fermentation. In most of legumes, soft heat treatments can improve the digestibility of proteins and carbohydrates. In the case of probiotics, Betoret et al. [7] have shown that when bacterial cells included in an apple matrix have been subjected to a controlled stress as a soft air drying at 50°C, they better withstand storage at room temperature and the *in vitro* digestion process. In a similar way, Bass-Bellver et al. [8] obtained powdered food ingredients by freeze-drying or hot air-drying blueberry bagasse. Results showed that blueberry bagasse powders dried by hot air released more anthocyanins to the liquid phase after the gastrointestinal digestion *in vitro*, therefore, being more bioaccessible. In addition, alternative and also called green technologies have emerged. These are technologies such as ohmic heating, mild electric treatment or pressure treatments not generating effluents and energy efficient. These technologies make possible to reduce thermal treatments and even increase the functionality of some bioactive components or the digestibility of proteins. Many studies have been carried out to demonstrate that the application of HPH to liquid foods can modify the bio accessibility or bioavailability of its bioactive compounds. Treatment with HPH in mandarin juices increased the bio accessibility of total carotenoids by five times, although in the case of flavonoids, no such drastic changes were observed. Therefore, HPH treatment was recommended to produce tangerine juices that promote health, mainly through the improvement of the bio accessibility of the carotenoids contained therein [9]. Also, in legumes or cereals, the application of conventional processing techniques (e.g., cooking, autoclaving, germination, extrusion, and

fermentation) to reduce or eliminate antinutritional compounds is well established. Nonetheless, such techniques, mainly those applying aggressive heat treatments, are often detrimental to other food constituents, so alternative green technologies that are applied under mild conditions are preferable.

## Conclusion

The traditional Mediterranean Diet has a strong cultural and gastronomic background that facilitates its use as a tool for healthy food choices. The right foods are incorporated to tasty recipes that are eaten in a relaxed atmosphere of social relationship. People not only choose meals for their benefits on nutrition and health but also for their taste, palatability and social sense. Food technology and scientific advances show us how the low processing of some fruits, vegetables or legumes, the adequate treatment of wastes and bioproducts or the application of alternative technologies to typically Mediterranean foods allow a better exploitation and, in many cases, increase food functionality contributing to a more sustainable food system. Processed foods can combine the need for convenience, long shelf life and palatability required by consumers with the raw materials and nutritional principles typical of Mediterranean Diet. Furthermore, ingredients from by-products with a Mediterranean food design could be used to improve the adherence to Mediterranean Diet.

Moreover, these foods must be combined with the promotion of cultural and social values that are reflected in a lifestyle in agreement with the environment. Thus, foods produced with low processing taking advantage of the scientific advances and with a convenient (ready to eat) design, must be integrated into traditional Mediterranean recipes that allow: To balance nutrients, to keep on Mediterranean consumption patterns and to promote local varieties and cultural heritage.

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