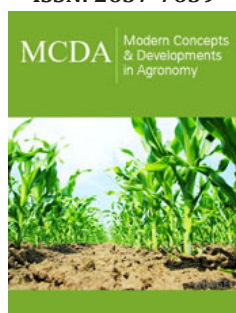


Antioxidants Can Be the Effective Measures to Mitigate the TFAs in Edible Oils

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Abstract

Unsaturated fatty acids (UFAs) in edible oil will isomerize to form *trans* fatty acids (TFAs) during the heating process, which are harmful to human health. Antioxidants are the simple, effective and low-cost measures to mitigate the TFAs in edible oil. This paper analyzes the reason for mitigating the formation of TFAs in edible oil by antioxidants and the main reasons why the potential of antioxidants has not been fully developed, and their future development direction are proposed.

Opinion

Edible oil is one of the most important and indispensable food types for people, with a large industrial scale. In 2021, the global consumption of edible oil reached 2.128 billion tons with an average annual growth of 2.56% (USDA). Unsaturated fatty acids (UFAs) in edible oils are isomerized to form *trans* fatty acids (TFAs) during the heating process [1,2]. Excessive intake of TFAs has been confirmed to cause more than 500,000 deaths from coronary heart disease, increasing the risk of heart disease by 21% and the annual global mortality rate by 28% [3]. Thus, WHO issued a statement in 2018 to “eliminate” TFAs from food worldwide by 2023. Currently, the edible oil industry has been trying to reduce TFAs in edible oils by optimizing the thermal processing conditions and improving the thermal processing equipment, but the problems of limited reduction and high cost are still existed. Although regulating the heating temperature and time is the most direct and effective method to reduce the amount of TFAs, the actual heating temperature is too low or the heating time is not enough, will influence the texture, flavor or taste of fatty foods. Therefore, exploring the effective mitigation measures of TFAs has become an urgent need to solve major problems and overcome technical difficulties in the global edible oil industry.

Antioxidants are the kind of additive which can delay or prevent the oxidation process, improve the stability and prolong the storage period of food. The correct use of antioxidants can not only prolong the storage life and shelf life of food, bring good economic benefits to producers and consumers, but also bring better food safety to consumers [4]. Recently, antioxidants are divided into synthetic antioxidants and natural antioxidants, both of which have been used in the production, especially for the latter. We hold the opinion that the use of antioxidants will be an effective measure to mitigate the TFAs in edible oils, which is confirmed by the studies. Excitingly, the synthetic (TBHQ, BHA and BHT) and natural (δ -tocopherol, rosemary extracts, phytosterol, ascorbic acid, retinol acetate, gallic acid, resveratrol, et al.) antioxidants, except their own excellent antioxidant effect, have been demonstrated to significantly mitigate TFAs and induce TFAs converting into beneficial conjugated fatty acids [5-11]. Moreover, it is found that the mitigation effects of antioxidants on TFAs are in correlation with their own antioxidant capacity, levels, structure and environmental status (heating temperature or time). The relationship among them seems very important and needs to be clarified (Figure 1).

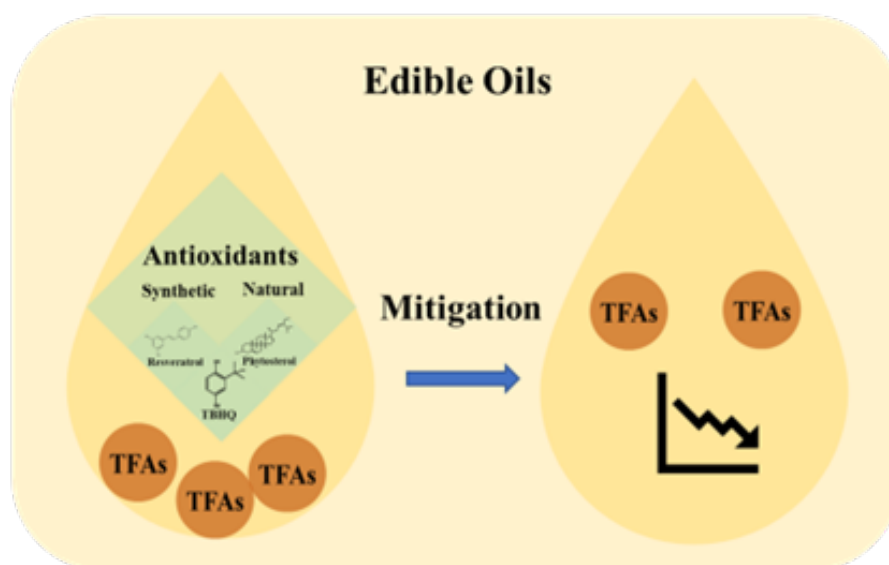


Figure 1: Antioxidants can mitigate the *trans* fatty acids (TFAs) in edible oils.

Notably, due to the potential safety issues of synthetic antioxidants, the natural antioxidants have become the inevitable trend in the development of the edible oil industry. However, natural antioxidants cannot replace synthetic antioxidants in the short term due to performance, source, price and other reasons. Therefore, strengthening the research of the regulation mechanism of antioxidants on the TFAs are the important practical significance for exploring and developing low-cost and high-efficiency natural antioxidants with high temperature resistance, high radical scavenging activity and high fat solubility concurrently. Meanwhile, the use of antioxidants to maximize the mitigation of TFAs should not affect the sensory properties of the edible oil. More importantly, concerns should be raised about the safety of edible oil products processed with antioxidants.

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