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NUTRITIONALLY IMPROVED CHOCOLATE SPREADS – A REVIEW

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review paper

Summary

Chocolate spread is one of the favourite breakfast meals and snacks among people of all generations. Increased consumption of these kinds of products with high-energy value leads to obesity and several health problems. Many researchers are trying to produce acceptable products with lower calorie values by reducing fat and sugar contents. Oleogels are one of the most explored solutions for the development of low-fat products and products with lower content of saturated fats. In addition, the fat composition of chocolate spreads can be changed to obtain a better fatty acid profile. Products with a low-sugar content have been proven to have sensory acceptability when sweeteners with low caloric value were used. In addition, researchers proved that chocolate spreads could be enriched with many different bioactive components by using by-products and minimally processed raw materials in the production process.

Keywords: chocolate spread, fat-reduction, bioactive components, sugar, obesity

Introduction

Chocolate spreads are one of the most desirable breakfast meals for children and adults. However, because of their composition, high content of sugar and fat, they are high-energy products. Although high contents of fat and sugar are the main causes of high-calorie values, they are also the main reason for the sensory acceptability of chocolate spreads. The chocolate spread consists of solid particles suspended in the fat network (Manzocco et al., 2014). The fat network is directly linked to sensory characteristics such as mouthfeel, texture and taste (Marangoni et al., 2012).

Nowadays, a great number of people in Western countries are dealing with obesity and weight gain for which the main reason is the frequent and excessive consumption of such products (Fernández-Murga et al., 2011), and this problem puts a new perspective on food producers. The number of obese people is increasing every year, which causes many serious health problems. Because of this problem, the industry is directed to the production of products with reduced fat and sugar contents but at the same time, the food market demands that these products have similar sensory properties as a product with conventional amounts of sugar and fat (Azaïs-Braesco et al., 2009; Acan et al., 2021).

Functional food is a widely used term, but it does not have a universal definition. One of the accepted phrases that are used for defining functional foods is: "Functional food is food in which the concentrations of one or more ingredients have been manipulated or modified to enhance their contribution to a healthful diet" (Thomson et al., 1999).

Chocolate spread is one of the most favourite breakfasts for children and adults. It is composed of high contents of sugar (38 - 42 %) and fat (25 - 40 %), but also contains milk powder, cocoa powder, emulsifier, etc. (Shamsudin, 2013; Popov-Raljić et al., 2013). Chocolate spread contains cheaper vegetable fats, unlike chocolate that contains cocoa butter. In addition, it is required that these products are not solidified at room temperature, because of spreadability, creamy and smooth taste (Lončarević et al., 2016).

This paper gives an overview of low-fat, low-sugar and enriched chocolate spreads. The way a chocolate spread is affected by the change in the composition, sensory acceptability of modified products and their influence on the health of consumers are discussed.

Low-fat chocolate spreads

Low-fat products are becoming increasingly popular among consumers because of their lower energy value, but the fat phase in products like chocolate spreads is very important since it is responsible for their quality and sensory properties (Do et al., 2007). Due to fat's unique properties, the production of low-fat products is challenging, because it is expected that these products will have comparable flavour, taste, and stability as full-fat products (Devereux et al., 2003).

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One of the possibilities for fat replacement is the use of edible oleogels (Almeida and Lannes, 2017). Oleogels are being increasingly used in the development of new food products with lower contents of trans- and saturated fats. Although the main health benefit of oleogels is due to the reduced content of saturated fats, some studies have shown that oleogels have health benefits by reducing the content of lipids in blood after consumption (Hwang, 2020).
Schneider and Souza (2009) produced milk chocolate with the addition of gelatin, which showed an ability to form gels that have a melting point close to body temperature (Karim and Bhat, 2009). After that, Almeida and Lannes (2017) produced chocolate spread with gelatin from chicken by-products. They used 0.3 to 1.2 % of gelatin for the replacement of 15 to 100 % of vegetable fat. The addition of a fat replacer caused the lighter colour of products, higher water activity, and lower consistency. This indicates that chocolate spreads with gelatin could be stored at lower temperatures, and still be spreadable, unlike conventional spreads, which are solid at low temperatures (10 °C). Gelatin is a gelling agent used for centuries in food production. It is a protein extracted from collagen with the ability to form a thermoreversible gel, which is important for food texture (Almeida and Lannes, 2013).
Chocolate spreads with lower fat content can also be developed by a combination of different fats and oils using a mathematical model that can predict food's physical properties (Manzocco et al., 2014). For this purpose, palm-based fats and vegetable oils (sunflower and extra virgin olive oil) were combined. The authors managed to predict which minimal lipid concentration is required to obtain a homogeneous spread with acceptable physical properties. They concluded that in this way, fat can be decreased up to 50% which would also decrease saturated fatty acid content by 90%.

Chocolate spreads with altered fat composition

Chocolate spread quality is based on its composition, mainly on fat types used in the recipe. In the production of chocolate spreads, vegetable fats are mainly used, which give a creamy taste, spreadability, homogeneity, stability, etc. to the product (Lončarević et al., 2016). These solid fats can have a high content of saturated and trans-fatty acids (Pehlivanoğlu et al., 2018). Excessive consumption of saturated fats is linked to an increased risk of cardiovascular diseases. It was shown that the replacement of saturated fat with polyunsaturated fat could affect a decrease of low-density lipoprotein cholesterol in the blood (Siri-Tarino et al., 2010). In the last few years, researchers are trying to replace solid fats in foods like chocolate spreads, but it is still very challenging to obtain products similar to that of conventional composition. This is mainly because of fat's unique effect on the texture and sensorial acceptability (Popov-Raljić et al., 2013).
Jeyarani et al. (2013) produced chocolate spread with soybean oil to increase the content of linolenic acid. Commercial hazelnut spread had a higher content of oleic acid compared to spreads with soybean oil. In addition, linolenic acid was not detected in the commercial spread, unlike in spreads with soybean oil. It is important to state that those spreads, besides nutritionally improved fatty acid content, had acceptable sensory properties. Rapeseed oil can also be used in chocolate paste production when combined with shellac oleogel. This gelling agent enabled a reduction of palm oil and obtaining the stable product (Patel et al., 2014). Fayaz et al. (2017) also used oleogels (monoglyceride, beeswax and propolis wax) for the replacement of palm oil with pomegranate seed oil. This oil is very well known for its high content of polyunsaturated fatty acids (Aruna et al., 2016). Sunflower and olive oil structured with hydrocolloids were also used in the production of chocolate spreads as replacers for coconut fat. Results showed that the combination of these oils and coconut fat in the formulation can result in sensory properties similar to spread produced only with coconut fat (Bascuas et al., 2021).

Low-sugar chocolate spreads

Sugar is one of the most represented raw materials in chocolate spread formulation (38 - 42 %) (Shamsudin, 2013). Because of the increasing obesity in Western countries, the demand for low-calorie products is increasing. Replacement of sugar with lower-calorie sweeteners is one of the best solutions for this problem.
Sugar-free chocolate spreads could be produced with sweeteners derived from disaccharides, which have lower calorie content and would be suitable for diabetics (Shamsudin, 2013). Although this spread was less sweet, it had a pleasant taste and a good spreadability.
Petković et al. (2012) also produced a sugar-free spread with maltitol as a replacer for sucrose. They examined different contents and ratios of maltitol and sucrose. Since maltitol is less sweet than sucrose, these spreads had less pronounced sweetness but were still sensory acceptable. The main conclusion was that with the use of this sweetener, the energetic value of spread could be reduced by 15% (Petković et al., 2012).

Chocolate spreads enriched with bioactive components

Chocolate spread is a chocolate derived, low-cost product that has a lower content of bioactive components than chocolate. In the last few years, many researchers are dealing with the enrichment of chocolates with polyphenols (Barišić et al., 2021) and thus enrichment of chocolate spreads is also becoming more interesting. Acan et al. (2021) used a by-product of the wine and juice industry, grape pomace, as a material for chocolate spread production. Grape pomace is rich in phenolic components and resveratrol, a well-known grape component that has a positive effect on cardiovascular health. The addition of this raw material in chocolate spread significantly increased the total phenolic content, but as the content of grape pomace increased, the digestibility of phenols decreased. The authors suggested that this is because of the high content of proteins in dried grape pomace used in production. Also, the sensory analysis showed that the usage of grape pomace in shares higher than 10% harmed acceptability. This is because grape pomace was used as a sugar and milk powder substitute, which decreased the sweetness of spreads. Also, phenolic components are known to have a slight bitterness, and the increased content of these components in chocolate spread affected sensory acceptability.

Palm oil usually used in chocolate spread production is refined, bleached and deodorised. These processes decrease the content of carotenes and tocols that are naturally present in red palm oil (Gee, 2007). Carotenes present in red palm oil have antioxidative activity and can protect against vitamin A deficiency (Sundram, 2005). Tocotrienols that are also present in red palm oil can improve cardiovascular health (Yew et al., 2007). Because of the great potential of red palm oil, El-Hadad et al. (2011) used it in chocolate spread production. Contents of bioactive components increased in such spreads, but they were less sensory acceptable. In addition, the study showed that the storage at ambient temperature caused the reduction of carotenes, tocopherols and tocotrienols, which means that it would be preferred to store this spread in a refrigerator, which would harm the spreadability of the product.

Chocolate spreads are very often produced with different kinds of nuts, among which, hazelnut is most common. Amevor et al. (2018) used cashew nut as a replacer in the production of spread and examined its effect on the quality of spreads. Cashew nuts are rich in phenolic components, fibres, minerals, proteins, etc. (Chen et al., 2006). Thus, the addition of this raw material in chocolate spread resulted in increased content of minerals, fibres and proteins.

Conclusions

During the last few years, many solutions for the development of nutritionally improved chocolate spreads have been established. One of the most promising solutions is the usage of oleogels for the production of low-fat spreads and usage of low-calorie sweeteners for the production of low-sugar spreads. However, many of the products developed, including the ones with increased contents of bioactive components, have lower sensory acceptability. Further research is needed to solve this problem and find a solution to obtain a product that will not significantly differ from conventional ones.

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