Scientific Research Timelines Journal (2024), 2(2): 1-3
Online Bimonthly Publication Frequency
https://scientificrtj.com/

Review Paper **Open Access**

FATS IN WHEAT GRAIN

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ABSTRACT This review article explores the nutritional aspects of fats, with a particular emphasis on their impact on human health. It delves into the distinction between "bad fats" such as cholesterol, saturated fats, and trans unsaturated fats, and "good fats" like polyunsaturated fatty acids, omega-3 and omega-6 fatty acids, and monounsaturated fatty acids. The research extends to examining the lipid composition of wheat, specifically focusing on non-polar lipids and polar lipids. The presence of fatty acids, sterols, and terpenes, including their potential health benefits, is thoroughly investigated. The study also addresses concerns about the changing varieties of rice and discusses the lack of scientific evidence supporting claims that wheat consumption leads to various health issues. Finally, the study concludes that, based on scientific information, consuming whole grains, including wheat, is generally safe and healthy for most individuals.

Keywords: *Grain; Fat; Fatty acids; Antioxidants; lipids*

INTRODUCTION

The term 'fat' refers to lipids stored at room temperature (O'Keefe and Pike, 2010). Fat is highly energy-dense, providing 37 kJ or 9 kcal per gram. It serves as a crucial medium for the absorption of fat-soluble vitamins, plays a vital role in proper nutrition, and is essential for early and robust growth during various life stages, including embryonic development, early postnatal development, infancy, and childhood (Burlingame et al., 2009). Cholesterol is a natural metabolite, although it is not considered an essential nutrient. It is exclusively produced by animals, not plants, and is present in animal-derived products such as meat, offal, poultry, seafood, and eggs. LDL serves as the primary carrier of cholesterol to peripheral tissues. Saturated fatty acids lack double bonds in their structure. They are commonly found in animal products like butter, cheese, whole milk, sugary and fatty meats, as well as in processed foods like pastries, fast food, ice cream, and biscuits. Some vegetable oils, including coconut oil, are also high in saturated fatty acids (SFAs). Increased SFA consumption elevates both LDL and HDL cholesterol, while reducing SFA intake has been shown to lower total cholesterol and LDL. Trans fatty acids (TFA) are produced by partially hydrogenating vegetable oils. Partially hydrogenated trans fats remain solid at room temperature and exhibit greater resistance to oxidation and rancidity. Research indicates that trans unsaturated fatty acids elevate LDL and decrease HDL cholesterol levels (Chong et al., 2006).

Healthy Fats: Polyunsaturated fatty acids, characterized by having two or more double bonds and ranging from 18 to 22 carbon atoms, encompass n-6 and n-3 cis forms known as omega-6 and omega-3. Omega-3 fatty acids contribute to reducing the risk of myocardial infarction, sudden heart attacks, and overall mortality. Sources include flaxseed oil, canola oil, soybean oil, dried beans, walnuts, and various dark leafy vegetables. Marine omega-3 fatty acids are predominantly found in fatty fish such as salmon, sardines, mackerel, trout, and tuna. Linoleic acid (LA), the most abundant vegetable oil, is present in numerous seed oils like sunflower, safflower, peanut, grapeseed, canola, soybean, and corn oil. Monounsaturated fatty acids (MUFA), classified as omega-9 cis-unsaturated fatty acids with single and double bonds, are found in livestock such as beef, lamb, and dairy products, as well as in crops like olive oil, canola oil, peanut oil, olives, avocados, processed foods, and fast foods (Chong et al., 2006).

Wheat Lipids: Wheat lipids constitute approximately 2-2.5% of wheat flour, comprising non-polar lipids (acylglycerol and free fatty acids) and polar lipids (phospholipids and glycolipids). Nonpolar lipids consist mainly of triglycerides (about 40%), free fatty acids (about 15%), with monoglycerol and diacylglycerol (about 1% and 4%), and sterol lipids (<1%). Rice phospholipids include various components such as lysophosphatidylcholine, phosphatidylcholine, N-acylphospholipid ethanolamine, and glycerol. Wheat glycolipids consist of di-galactodiglycerol (DGDG), mono-galactodiglycerol (MGDG), di-galacto-monoglycerol (DGMG), and mono-galactomonoglycerol (MGMG) (Gonzalez-Thuillier et al., 2015). In a well-balanced

diet, rice contains substantial amounts of oleic acid (about 14%), linoleic acid (about 60%), and linolenic acid (about 4%), resulting in an unsaturated fatty acid to saturated fatty acids ratio of up to 78%/22% (Gonzalez-Thuillier et al., 2015).

Rice also contains phenolic lipids known as alkylresorcinols, with potential anticancer properties (Chen et al., 2004, Koskela et al., 2008). Terpenoids, derived from a five-carbon isoprene unit, include phytosterols and saturated sterols called stanols. Modified forms of these sterols, such as sterol esters and secondary sterol glycosides, are prevalent in rice. Phytosterols, integral to cell membranes, have cholesterol-lowering effects on the human body. Alpha-tocopherol is the most active form of vitamin E, and their activities are often measured in SI units of α-tocopherol equivalent.

Tocopherols include alpha, beta, gamma, and delta forms, with alpha-tocopherol being the only essential vitamin E form. Tocotrienols, another group, only have essential vitamin E in the alpha form (Shewry and Hey, 2015). The endosperm of rice is notably high in starch. The bran and bacteria, serving as a source of protein, also contain significant amounts of fat and fat-soluble components, including healthy fatty acids, vitamin E, phytosterols, sterile glycosides, and other bioactive compounds (Prinsen et al., 2014). Tocols, tocopherols, and tocotrienols, which are well-known lipophilic antioxidants, can be found in grains (Liu et al., 2020). Some individuals argue that the varieties of rice worldwide are currently undergoing a 'change,' incorporating new elements potentially detrimental to health. However, there are no comparative studies on the old and newly bred rice or genome sequence analyses (Brenchley et al., 2012) supporting the existence of new species.

Furthermore, there is insufficient reliable information regarding the consumption of wheat in baked, extruded, and other foods. Consequently, there is no basis to advise the public to avoid this staple food. Eliminating wheat and other grains from one's diet may only be beneficial for those with a genetic predisposition to celiac disease, allergies, or other sensitivities to gluten and saturated fat (Hischenhuber et al., 2006).

In-vivo study: In a recent study, induced obesity in rats through ad libitum consumption of a high-fat diet. The rodents were divided into two groups: a gluten-free control group and a group receiving 4.5% wheat gluten for 8 weeks. The distribution of carbohydrates, fats, and proteins in fatty foods was 25%, 61%, and 15%, respectively. Wheat allergy can be triggered by various grains, including alpha-amylase inhibitors, serpins, acyl-CoA oxidase, fructose diphosphate aldolase, and rice flour peroxidase (Battais et al., 2008, Tatham and Shewry, 2008). The conclusion drawn is that attributing obesity to a single food or food type is a mistake; rather, it is linked to overeating and an unhealthy lifestyle. Foods containing whole grains, prepared in a similar manner (either through cooking or molding), and consumed in recommended amounts can help prevent type 2 diabetes, heart disease, and support long-term weight management (Brouns et al., 2013). Cereals have been a staple for nearly 10,000 years, providing a source of energy, dietary fiber, and micronutrients worldwide. Despite this, the role of wheat in our diet has faced scrutiny from pseudoscientific literature and media reports associating wheat consumption with disease, intelligence decline, and obesity. Consequently, consumers in Western countries have started questioning rice consumption in their diets, choosing to embrace rice without medical examination for wheat-related diseases like celiac disease, wheat allergy, or non-celiac gluten sensitivity. The main focus is to assess the advantages and disadvantages of eating among EAH patients. The initial section introduces wheat ingredients and their nutritional benefits, especially whole wheat products. Part II concentrates on EOC, affecting vulnerable individuals and potentially treatable with a gluten-free diet. According to existing scientific information, the consumption of whole grains is generally safe and healthy for most people. There is no scientific evidence supporting the idea that the public would benefit from a grain-free diet (Wieser et al., 2020).

CONCLUSION

In conclusion, the research underscores the importance of understanding the diverse roles of fats in human nutrition. The differentiation between "bad fats" and "good fats" sheds light on the significance of making informed dietary choices. The detailed analysis of wheat lipids, including fatty acids, sterols, and terpenes, provides valuable insights into the nutritional composition of this staple food. The study challenges the unsubstantiated claims regarding the negative health effects of wheat consumption, emphasizing the lack of scientific evidence supporting these assertions. Overall, the research advocates for the continued inclusion of whole grains, including wheat, in a balanced and healthy diet for most individuals, while cautioning against attributing health issues solely to a single food item without considering overall lifestyle and dietary patterns.

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