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How Can Cereal Items Boost Both Their Health Quality and Sustainability (Review Study)?

Sakena Taha Hasan[1] and Ammar AL-Farga[2*]

[1]Department of Food Science and Technology, College Food Science, Al-Qasim Green University, Iraq.
[2]Department of Biochemistry, Faculty of Science, University of Jeddah, Jeddah, Saudi Arabia.

Authors' contributions

This work was carried out in collaboration between both authors. Author STH provided concept, Investigation, study methodology, data validation and wrote original draft. Author AAF performed data curation, visualization and literature review, manuscript editing and supervised the study. Both authors read and approved the final manuscript.

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Review Article

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ABSTRACT

More sustainable cereal sector will conserve the agriculture (sustainable agriculture) and promoting wellbeing (physiological sustainability) at a quality appropriate to customers, regardless of their Social status (Sustainability Socio-economic). May increase the safety quality of cereal products A more integrative approach focused on reverse engineering, in the cereal market. Overall, full-grain products must be developed which contain less sugar, fat and salt. Hence the first key. The aim is to better understand the acceptance by consumers of these new, higher-nutritional cereal products value. Then there must be levers and locks at the technological, agrarian and genetic selection levels recognized. Latest reviews of literature and Committee reports stressed the value of maintaining structure of cereal foods by less extreme hydrothermal and mechanical processes, and increased use of prefermentation and/or preserva. Results of a analysis of human action required to fill the gap between observational and mechanical / animal studies, notably in reaching a conclusion on the health-promoting potential of whole grain antioxidants made from cereals.

**Corresponding author: E-mail: alfergah83@gmail.com;*

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1. INTRODUCTION

Some activities influence the nutritional content of cereal products, including the processes of grinding and fractionation added to the raw material and adding sugar, salt and fat to formulations of the food [1]. During grinding, high-nutritional components found in branches and germ fractions, such as fibre, micronutrients and protective phytochemicals, are separated from grains; while the introduction of salt, sugar and fat causes problems of public health, such as increased prevalence of obesity, type 2 diabetes, cardiovascular diseases and [1].

A common example is breakfast cereals for children, typically made from processed grains (with very few protective micronutrients) which are extruded under strict conditions (causing a high glycaemic index) and high in sugars and fats (risk factors for overweight and obesity development) [2]. With the goal of developing sustainable diet, several questions need to be answered at different cereal sector rates, as follows: 1) At agricultural production point, can we choose genetic varieties which are the richest in protective micronutrients or use cereal varieties which are currently very poor in cultivation but which are rich in nutrients of interest while retaining a satisfactory yield? Could we use cultivation methods that are more environmentally friendly while still maintaining the nutritional benefit of cereals? [1]. At the level of first transformation, what degree of flour refining should be achieved to maintain both good acceptability and good nutritional quality of cereal products? Can we generalise the techniques for isolating the aleurone layer (rich in lysine and protective micronutrients but also in potential allergens) and systematise the fortification of grain products using this fraction [3,4]? How can we make better use of the germ fraction? 3)Could webuild "softer" technologies for formulating grain products at second transformation level? From a technical viewpoint, can we raising sugar, salt and fat levels [5]? In other words, a more sustainable cereal sector must safeguard the environment (environmental sustainability), human health (physiological sustainability) and cultural practices (cultural sustainability) at a price that is acceptable for consumers, regardless of their socio-economic status (socio-economic sustainability) [1]. The main purpose of this mini-review is to address possible changes in the health potential of cereal products that could be made from "farm to plate" from a more comprehensive and integrative viewpoint in the industry.

2. STATE OF THE ART AND INQUIRIES CURRENTLY UNDER WAY

2.1 Health Effects of Whole Grain versus Refined Cereals and of Highly versus Slightly Processed Cereal Products

Overall, while the normal high consumption of more or less whole grain products is associated with a lower prevalence of overweight / obesity, type 2 diabetes, cardiovascular disease and other gastrointestinal cancers, the opposite was found for the consumption of refined grain products, although fewer studies of the latter have been carried out and several studies have shown that there is only a lack of associatives [6,7,8]. A recent metanalysis, for example, has shown a significantly higher prevalence of type 2 diabetes in the highest white rice consumers [9]. The same result was obtained in a previous pooled analysis (17%), which also showed that the prevalence of type 2 diabetes among the highest consumers of unrefined brown rice was significantly lower (some 11%) [10]. With regard to intervention studies, all researchers agreed that further studies are needed to establish a clear causal role of phytochemicals in the metabolic health benefits of whole grain cereals and in their ability to reduce chronic disease progression [8,9,10]. For example, in humans, the high antioxidant potential of cereal products, as measured *in vitro*, was not convincingly confirmed *in vivo* [11,12]. The health consequences are more apparent about the salt, processed fat and sugar added to cereal products; excessive salt consumption can cause hypertension, while excess sugar and fat intake is a risk factor for cardiovascular disease, obesity, type 2 diabetes and other cancers. Incidentally, a contributing factor for the production of type 2 diabetes is the existence of rapidly bioavailable sugars in very refined and processed cereal products too. Adding salts, however, is mainly a concern for the baking industry, with bread being one of France's key sources of added salt (i.e., z25 per cent of total daily salt consumed) [13] and adding fats and sugar.

2.2 The Importance of the Physical Structure of Cereal Products

The physical structure of grain products is increasingly recognized as a parameter that controls the health benefits of whole grain products, as it affects the sustained feeling of satiety (limiting snacking between meals) and the gradual release of nutrients, including starch digestion glucose such as pasta [14,15,16]. Although cereal processing is critical for the final physiological and health effects [17], highly processed grain products typically have a less compact physical structure and are therefore less satiating [18,19,20]; For example, muesli-type breakfast cereals with a minimally processed low-glycaemic index (GI) are more satiating than high-GI extruded breakfast cereals [21]. If acceptability and satisfaction are not reached, however, maximizing the satiation effect is not adequate [22].

2.3 Can Behaviours be Changed?

The acceptability of goods by consumers is relevant in relation to the issues surrounding wholemeal flours and more specifically the issue of reducing sugar, salt and fat content. Some recent surveys offered insight into the acceptability of grain products with less refining. "The customer preference requirements are not always consistent with the technical advances introduced to comply with the dietary guidelines" [23]. The incorporation of fibre into French baguette, for example, diminished their visual acceptability; Second, as part of the Health Grain project, a survey was conducted among consumers in Germany, Finland, Great Britain and Italy on the health and hedonic preferences of eating bread, pasta and biscuits made from whole-grain or refined flour [24]. Participants were generally aware of the term 'whole grain' in an explorative study of whole grain perception, but many key barriers to whole grain consumption were still evidentlike intake to a reduced risk of type 2 diabetes and heart disease among adults. Nevertheless, in addition to educational activities, the agri-food industry has a range of opportunities to produce innovative yet inexpensive food items that can supply whole grains in a wide variety of types [25].

2.4 Genetic and Environmental Factors

In the context of European research programmes, plant breeding projects were undertaken to study the genetic and agronomic variation of the components of the germ, the aleurone layer and other peripheral portions of grains [26,27,28,29,30,31,32,33,34,35]. The rates of certain wheat micronutrients, particularly minerals, depend on genetic origin (magnesium), agronomic conditions (zinc) and sometimes interaction (iron) between these factors [26]. Internationally, however, there are initiatives for the strengthening of iron and zinc wheat (CIMMYT) to address nutritional deficiencies in some developing countries. It has also been shown that the quality of fibers and their composition (insoluble / soluble ratio) depend on the genetic and agro-environmental conditions [34,36]. The quality of soluble fibers (mainly wheat arabinoxylans) is, however, a highly heritable trait [37], i.e. it can be enhanced by genetic means. Therefore, it seems easier to look for grain varieties with a good balance of various protective compounds and to encourage genetic diversity and a guarantor of this balance-instead of selecting varieties with only a few beneficial compounds. First, it would be important to decide a posteriori whether intensive yield selection induced a corresponding decrease in the overall content of micronutrients. This appears to be due to the 'dilution' effect (after increased grain capacity to absorb starch) [38].

2.5 Legumes as Additional Ingredients in Cereal Products

Legumes were a common, staple food for a long time. Nevertheless, in France, legume consumption has decreased so that the average intake in 2006,2007 was only 9.7 g / day with a consumption rate of 29.7% [39]; this represents an insignificant decrease of 2.4% relative to the rate found in the INCA1 1998,1999 study [40]. Although in developing countries the combination of cereals and legumes has long been practiced, this combination is less common in developed countries. Several recent research has illustrated the importance of such a mixture as pasta [41], for examplein France, the margin for the consumption of legumes e which have a very significant nutritional value is high, and this could be accomplished through cereal-product technology (including bread and pasta, which are good vectors of pulses) to provide all of the necessary amino acids for humans, particularly if the propensity to eat more plant products is confirmed in the coming years.

3. CONCLUSION

Improving the health potential of cereal products requires an approach focused on the reverse engineering. Before all other factors, priority should be given to the health value of cereal products and to acceptance by consumers. However, several unresolved questions continue to be addressed about the safety benefits of cereal-based foods. Second, the cause-effect relationship was not well known enough to support the findings of epidemiological studies. Second, researchers need to identify whole grains and their bioactive compounds more specifically, and evaluate how these factors work to influence the metabolic and physiological functions well beyond those of the gut. Fourth, further studies are required to confirm the role of whole grains in protecting against colorectal cancer through their quality of fibres.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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