Review Article

Nutraceuticals and Fortified Foods Supplements in India: Challenges and Opportunities – A Comprehensive Review

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ABSTRACT

Background: As the growing interest in the overall health of the community the term nutraceuticals, functional foo d ingredients, and dietary supplements are gaining importance worldwide. **Objective:** The study aimed to identify and study th e importance of food fortification and the importance of nutraceuticals for their efficacy and effectiveness in India. **Methods** Pubmed and Google Scholar were searched and only article and information relevant to the topic was selected for review. **Results:** A total of 53 articles were selected for review which included information about the nutraceuticals and fortifie d Foods Supplements. **Conclusion:** There are no scientifically proven functional foods for improving public health. There is a requirement to change the platform of a balanced and nutritious diet required for healthy people.

Key Words: Fortification, Nutraceuticals, Functional Foods, Public Health, Dietary Supplements

Functional foods are termed as products that resemble traditional foods but possess different physiological benefits. However, nutraceuticals are those derived from foods, but are used in the medicinal form of pills, capsules or liquids and again have demonstrated physiological benefits. In other parts of the world, the latter group has now been termed under a new category as natural health products that promote health. Food fortification (FF) is defined as the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food, to prevent or correct a demonstrated deficiency of one or more nutrients in the population or specific population groups [1].

Fortification therefore differs from enrichment, which is the process of maintaining the nutrients to a food removed during the process or production. FF includes many process like bio fortification, microbial bio fortification and synthetic biology, commercial and industrial fortification, and home fortification. As we know that bio fortification involves creating micronutrient crops using traditional breeding techniques and biotechnology, the term biotechnology (genetic engineering) is to bio fortify staple crops is more modern and has gained much attention in recent years. Example of this approach is the transgenic 'Golden Rice containing twice the normal levels of iron and significant amounts of beta-carotene [2]. Microbial bio fortification involves method using probiotic bacteria (mostly lactic acid bacteria), which ferment to produce carotene either in the foods we eat or directly in the human intestine [3].

Rice and wheat are the main staple foods in India; especially the eastern and southern parts mostly depend on rice while the northern and western part of the country depends on wheat. From the world scenario, on average 30% of calories come from rice and it could reach up to more than 70% in some low-income country [4]. According to the GAIN report, the domestic consumption of milled rice is shown at about 97.6 MMT in 2017/18 and wheat consumption has been given at about 93 million. Moreover, the milling process causes the loss of almost all vitamins and minerals of nutritional importance [5]. As we know that the principle reason for the growth of the functional food market is necessity of the current population and health trends. As the populations are aging, includes life expectancy continues to rise, as does the contribution made by older individuals to the total population. People today are more nutrition-concern than ever before, their interest in health-related information being met by many courses of information. [6]

Technical information: As we know that all foods are functional to some extent because all foods provide taste, aroma and nutritive value. As the foods are now being examined intensively for added physiologic benefits, which may reduce chronic disease risk or otherwise optimize health. It is these research efforts that have led to the worldwide interest in the growing food category and now recognized as "functional foods." [7] Another term often used as a synonym with functional foods is "nutraceuticals," Several factors are responsible for the fact that this is one of the most promising areas of research in the nutrition sciences today which gives an emphasis in nutritional and medical research on associations between diet and dietary constituents and health benefits, and a favorable regulatory environment including the consumer self-care phenomenon, and rapid growth in the market for health and wellness products is observed [8]. According to the Department of Health and Human Services, diet plays a role in 5 of 10 of the leading causes of death. An accumulating body of research now suggests that consumption of certain foods or their associated physiologically active components may be linked to disease risk reduction [9].

Functional foods of animal origin: Recently the most popular class of physiologically-active components derived from animal products are the (n-3) fatty acids, predominantly found in fatty fish such as salmon, tuna, mackerel, sardines and herring [10]. AS we know that DHA is a vital component of the phospholipids of cellular membranes, especially in the brain and retina of the eye, and is necessary for their proper functioning [11].

Functional foods of plant origin: Many plant foods or physiologically active ingredients derived from plants have been investigated for their role in disease prevention and health. However, only a small number of these have had substantive clinical documentation of their health benefits. An even smaller number have surpassed the rigorous standard of "significant scientific agreement" required by the FDA for authorization of a health claim. These plant foods currently eligible to bear an FDA-approved health claim include oat soluble fiber [12], soluble fiber from psyllium seed husk [13] soy protein [14] and sterol- and stanol-ester–fortified margarine [15].

Nutraceuticals and Functional Food: The term nutraceuticals is a combination of a nutrition and medicine, this term was introduced in 1989 [16]. Nutraceuticals are defined as "any substance that may be considered a food or part of a food and provides medical or health benefits, including the prevention and treatment of disease [17]. According to International Food Information Council (IFIC) "foods or dietary components that may provide a health benefit beyond basic nutrition" [18]. Another body that is International Life Sciences Institute of North America (ILSI) given "foods that by virtue of physiologically active food components provide health benefits beyond basic nutrition" [19]. Finally the Nutrition Business Journal classified functional food as "food fortified with added or concentrated ingredients to functional levels, which improves health or performance [20].

Plant foods as nutraceuticals: Plant foods are a rich source of phenolic and poly phenolic compounds, there are blueberry leaves that are excellent sources of antioxidants [21]. The study shows that the leaves are useful to suppress the expression of hepatitis C virus RNA [22]. In cereals and legumes, the bran portion are also rich in phenolics as compared to the endosperm [23]. In recent studies, scientists had focused on marine algae and their constituents as nutraceuticals and functional foods for health-promotion [19,20]. As we know that marine algae are primarily used for the production of single-cell oil rich in DHA, and other PUFA [21], long-chain Omega three PUFA are chosen as their effectiveness in prevention and treatment of coronary heart disease [22], hypertension [23], diabetes [24], arthritis and other inflammations [25], autoimmune disorders [26] mental health and neural function as in depression and schizophrenia and cancers [27] and are essential for maintenance and development of normal growth, especially for the brain and retina [28].

Food fortification: Not a New Approach FF or enrichment is the term used for addition of essential vitamins and minerals to the basic foods improve the nutritional value and could overcome nutritional gaps in human beings. As we know that adding iodine to salt has been started simultaneously in many parts of the world [29]. Another is addition of Vitamin D and Vitamin A to the dairy products by 1932 [30]. As the time passes the addition of iron and folic acid to flour become common in the many western countries [31].

In this growing world the very important aspect of human life is health benefits of functional foods, it is not surprising that major companies are interested in developing such foods for the health and well-being of human race. A recent survey of 38 Chief Research Officers of major food companies conducted by the Institute of Food Technologists ranked research efforts into the development of foods considered to be healthful well ahead of research efforts directed toward food safety, or toward the development of either organic or reduced fat foods. After several studies over the last few years the tendency for consumers to view the "kitchen cabinet as the medicine cabinet" was initially identified as a leading trend in the food industry in 1994. This "Self-care" phenomenon remains a leading consumer trend today. The

10th annual consumer trend report from the Food Marketing Institute and Prevention Magazine found that that 76% of consumers strongly or mostly agree that eating healthy food is a better way to manage illness than medication [32]. The need of research is currently directed toward increasing our understanding of "functional foods." efforts to identifying how functional foods and food ingredients might help prevent chronic disease or optimizes health, thereby reducing healthcare costs and improving the quality of life for many consumers. An emerging discipline that will have a profound effect on future functional foods research and development efforts is nutria genomics, which investigates the interaction between diet and development of diseases based on an individual's genetic profile [33].

Other fields that will greatly influence the future of functional foods is biotechnology, and bioinformatics. Recent examples of biotechnology-derived crops which have tremendous potential to improve the health of millions worldwide include golden rice and iron-enriched rice [34]. The wide range of fortified foods has been justified by the fact that given dietary allowances for many nutrients are commonly not met through the normal diet. However, the virtual elimination of micronutrient deficiencies in developed countries has been attributed in large part to fortification [35]. Although it is well identified that FF is one of the preferred and cost-effective approaches in overcoming micronutrient malnutrition, its effectiveness in developing countries is yet to be demonstrated. One of the factors which have to be taken an account is the lack of simple and affordable technology to fortify foods with stable and bio available nutrients without compromising commonly accepted taste and appearance [36].

Global Issues of Fortification: The WHO issued guidance for the fortification of maize and wheat flour in 2009 based not on the distribution of intake across different segments of the population but on national per capita in takes and assuming that no other source provided the referred micronutrients [37]. As the fortification is implemented, there is often reluctance on the part of policy makers to reduce the content of the nutrient being fortified, even in the face of evidence that higher doses are not needed to demonstrate benefit. Folic acid fortification of grain products is well established as a means to reduce the incidence of neural tube defects [38]. The major group of nutraceuticals is endogenous in origin, being natural products responsible for eliciting activity in healthy humans. A number of plant constituents are increasingly becoming available, some individual entities e.g., resveratrol from grapes and wine and some complex combinations of constituents e.g., pycnogenol. The two glycol samino glycans (GAGs), glucosamine and chondroitin are derived from various animal materials. [39]

Recent advances in nutraceuticals & fortified food in india: Numerous studies conducted over the last few years have concluded that there are increasing numbers of consumers taking responsibility for well-being of their family, they are knowingly being aware regarding the current need for personnel health [40]. The "selfcare" concept of an individual is gaining a vast popularity in the world. As studied the 10th annual consumer trend report given by the Food Marketing Institute and Prevention Magazine summarized that 76% of humans are strongly or mostly agree on the concept that eating healthy food is a better way to overcome illness than medication. As the age is a very important factor as it affects the immunity of a individual so the humans of above 50 years are more prone to get ill in comparison to others.

CONCLUSION

As many functional foods may have promised for improving public health, but still claims are not scientifically proven. There are many pitfalls where studies need to be conducted to get the best results in every human body. Nutrition deficiency is a serious problem in India as well as many different parts of the world. FF can be expected to play a wide role in the improvement of this condition. So far, the studies conducted with FF in India found having positive results to improve condition in pregnant and lactating women, the elderly population, as well as a population of different socioeconomic categories. To fulfill a balanced and nutritious diet required for the healthy people FF approach is gaining par importance for the betterment of society.

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