Some functional foods and benefits of their bioactive components

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Abstract

Functional foods contain compounds that may minimize the likelihood of certain diseases or otherwise optimize health. The particular compounds are either naturally occurring in functional foods or be added by fortification or rather an enrichment. The groups of functional components comprise dietary fiber, fatty acids, isothiocyanates, carotenoids, flavonoids, phenolic acids, plant stanols and sterols, prebiotics and probiotics, soy protein, phytoestrogens, vitamins, and minerals. The current article provides an overview of various bioactive components in different functional food, along with their potential health benefits and future predictions for this new food category. Unless there is extensive scientific research to ensure the safety and efficacy of the functional foods products.The future of functional foods' improvement will require suitable regulations that are responsible for controlling to acquire the best effect in enhancing wellness with minimal health professional involvement and protecting the consumer against misinformation.

Keywords: Functional foods, Bioactive components, Safety, Efficacy, Health.

1. Introduction

As the food is essentially functional for supplying energy and nutrients that are needed to subsistence otherwise, many pieces of evidence show that some food components, not considered nutrients in the normal sense, may positively affect health. They may be somehow diminished cancer, stroke, and atherosclerosis; these food components are called bioactive compounds. Foods containing these food components are called functional foods (Institute of Food Technologists, 2012). Due to consumer interest in the relationship between diet and health, the demand for information about the benefits and the risks of functional foods has increased (Shandilya and Sharma, 2017). Functional foods are possibly considered as whole, fortified, enriched or enhanced foods, providing potentially beneficial impacts on health when consumed regularly at certain levels (Crowe and Francis, 2013).

The Food and Drug Administration (FDA) doesn't have an official definition for functional foods, but it issues regulations and guidance providing for various health and nutrient claims that may appear on labels of foods and beverages. Functional foods are divided into four categories: conventional foods, modified foods, medical foods, and foods for special dietary use according to the Academy of Nutrition and Dietetics (AND) (Hasler and Brown, 2009).

2. Types of functional foods:

Functional foods take many forms, some of which are conventional foods "unmodified", containing a high amount of effective phytochemicals that can now be identified and promote optimal health. These are found abundantly in fruits and vegetables, whole grains, soy foods, and many herbs.

Functional foods

Foods that are particularly high in antioxidants can be termed as functional foods. Antioxidants, such as vitamins A, C, and E, and the mineral selenium, destroy harmful particles in the blood that has been linked to heart disease, stroke and other complications. Tea (catechins), grape juice (resveratrol), berries (flavonoids such as quercetin), and citrus foods (flavonoids/limonoid) are examples of foods that contain antioxidants (Shalaby, 2019).

In contrast, modified foods are fortified with essential nutrients or other beneficial ingredients. Fortified foods can provide consumers with a wider range of food sources for a specific ingredient and its health benefits, such as orange juice fortified with calcium (Sharanya Rani and Penchalaraju, 2016). Fortified foods are considered functional, because they contain vitamins and minerals added to them to prevent diseases; for example, vitamin D is added to milk, as it promotes calcium absorption, which is essential for the prevention of rickets and osteoporosis. Folic acid is a B vitamin, fortification of cereal grain products that can help prevent neural tube defects in infants. Salt fortified with iodine may prevent enlargement of the thyroid gland as well as impaired intellectual development. Many of these foods are the result of public health initiatives to prevent nutrient deficiency diseases among populations in countries where intakes of certain nutrients are very low.

Bioactive components may naturally be found in various foods, which can be enhanced to increase the level present in the food, such as eggs with increased levels of omega-3 fatty acids (Sharanya Rani and Penchalaraju, 2016). Some are medicinal foods with specialized formulas. These foods require the help and supervision of a healthcare provider and are specially designed for people with specific health problems. Foods with special dietary use are somehow similar to medicinal foods but are available commercially also, they are not used under medical supervision. These foods are used to address dietary needs that you might have due to a physical or physiological condition, or others like lactose intolerance, celiac disease, or obesity. Lactose-free dairy products, gluten-free foods, and foods designed to aid weight loss are considered foods for special dietary use if you have those conditions (Table 1).

Table 1: Functional food categories and examples.

Conventional foods (whole foods)	**Garlic, nuts, tomatoes**
Modified foods	
Fortified	Iodized salt
Enriched	Folate-enriched breads
Enhanced	Energy bars, snacks and yogurts formulated with bioactive components
Medical foods	Metabolic and rare conditions, e.g. Phenylketonuria (PKU)formulas, free of phenylalanine. / Nutritionally incomplete modules; Food and fluid thickeners are used to manage dysphagia, allowing patients to meet their fluid and nutritional requirements. Modules containing one or several nutrients i.e. protein, fat and/or carbohydrate are essential for bespoke dietary regimes. / Specialised infant feeds; A variety of medical foods intended for infants are available and essential for normal growth and development in infants with medical conditions.
Foods for special dietary use	Infant foods, weight-loss foods, gluten-free foods, and lactose free foods

Functional foods bring great health benefits by protection against chronic disease, can also promote proper growth, support development and enhance mental performance, as it contains functional ingredients which will have a functional property like antimicrobial activity, antioxidant, anticancer, thus improving the quality of life (Table 2).

Table 2: Types of functional foods and health benefits.

Functional Food	Health Benefits
Fortified foods	
Juices with calcium	Reduce risk of osteoporosis, reduces hypertension.
Grains with folic acid	Reduce risk of heart diseases, neural tube birth defects.
Enhanced foods	
Beverages and salad dressings with antioxidants. Phytosterol enriched flavored milk and phytosterol enriched fruit bar.	May support overall health. Especially it can be used for cholesterol reduction.
Whole foods	
Oats	Reduces cholesterol.
Fruits and vegetables	Reduces risk of certain cancers and heart diseases.

3. The top healthful functional foods:

3.1. Fruits and vegetables

Fruits and vegetables may reduce and prevent the risk of certain diseases because they have specific compounds so they are considered functional foods. These compounds are known as phytonutrients and include; anthocyanin, isothiocyanate, lycopene, beta-carotene, lutein, zeaxanthin and allicin. Red fruits as pink grapefruit, tomatoes, watermelon, papaya and guava, contain lycopene, which has been linked to a reduction in certain types of cancer. Purple fruits and vegetables (or drinks made from these foods), like grapes, blueberries and eggplants, contain anthocyanin, which have been shown to lower blood pressure and reduce heart attacks.

Yellow fruits and vegetables, such as citrus, peaches, persimmons and nectarines, contain beta-cryptothanxin, which is linked with improved eyesight, growth and immune function. While Orange fruits and vegetables, including carrots, apricots, butternut squash and sweet potatoes, contain beta-carotene, which may help prevent macular degeneration.

Green fruits and vegetables, such as spinach, collard greens, mustard greens and avocado, contain lutein and zeaxanthin, which may help in the prevention of age-related macular degeneration, cataracts and heart disease. Some green vegetables, including kale, broccoli and bok choi, contain isothiocyanate, a nutrient linked with cancer reduction (https://www.keckmedicine.org/what-are-functional-foods/**).**

3.2. Dietary fiber

Dietary fiber is defined as the edible parts of plant or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine according to American Association of Cereal Chemists (AACC) in 2000. Dietary fiber includes polysaccharides, oligosaccharides, lignin and related plant substances. Different dietary fibers are classified as soluble in water such as pectin and gums. Or insoluble in water, such as cellulose, hemicellulose and lignin.

Dietary fiber can be considered a functional food when it imparts a special function " when used as an additive to bread " beyond the normal expected function such as lowering cholesterol, reducing glucose metabolism and insulin response (Prosky, 2000). Some foods with soluble fiber and considered as a functional food include;

3.2.1. Beans

Dry edible beans are nutrient-rich foods; it provides protein, loaded with complex carbohydrates, and contains little fat. They are good sources of B vitamins, potassium, and fiber, which promotes digestive health and help to prevent constipation. Nowadays, there is an increasing demand of health-promoting components "e.g. saponins" in edible bean products. Saponins are naturally occurring compounds that are widely distributed in all cells of legume plants. Clinical studies have suggested that saponin may play a major role in protection human body from cancer, reduce the levels of cholesterol and improve blood sugar regulation (Shi et al., 2004).

3.2.2. Oats

Oats, contain protein, fats, vitamins, etc., has health benefits beyond basic nutrition, enabling it to be called a functional food. Whole oat products have become more popular and their use has gradually increased as part of a healthy diet, Due to its dietary and health benefits that are mainly based on the total dietary fiber and β-glucan content, it is considered effective against diabetes, hyperlipidemia, hypertension and inflammatory conditions. Oat contains distinct molecular components with high antioxidant activity, such as tocopherols, tocotrienols, and avenanthramides (Perrelli et al., 2018).

3.2.3. Barley

Barley delivers similar benefits of oatmeal. Barley holds a promise as a functional food due to its content of dietary fiber fraction, particularly β-glucan, that have positive physiological effects, help lower cholesterol and assist with blood sugar control.

3.2.4. Legumes

Legumes are excellent sources of dietary fiber, protein, peptides, indigestible carbohydrates, B vitamins and many other important vitamins and minerals. Legumes have been recently introduced as unique functional foods due to the good evidence that they and their bioactive components have made them as excellent choice for supplementary treatment in type 2 diabetes, improve cholesterol levels, diminish oxidative stress and help maintain a healthy gut (Bahadoran and Mirmiran, 2015).

3.3. Berries

Berries" strawberries, cranberries, blueberries, raspberries or blackberries, berries" are among the healthiest and most nutritious foods on earth. Berries in general are wonderful functional foods because they have many of the potential health benefits including; improving the function of human arteries and hold promise as effective anticancer agents. Also, they contain active constituents such as anthocyanin pigments, which give them color and may offer health promoting benefits.

3.4. Fish and fatty acids

3.4.1. Wild fish

Wild fish are a great functional food, as they a good source of omega-3 fatty acids (EPA and DHA). Eicosapentaenoic acid (EPA; 20:5) and docosahexaenoic acid (DHA; 22:6) which can reduce the risk of heart disease and stroke and improve infant health when consumed by women during pregnancy or while breast-feeding. Two meals of seafood a week is a good goal for adults. Sardines, mackerel, tuna, salmon and swordfish contain the highest amount of omega-3 fatty acids while halibut, cod and shrimp contain smaller amounts. Generally, fish caught in the wild is recommended over farmed fish.

3.4.2. Omega-3 enriched eggs

Some eggs are enriched with three different omega-3 fatty acids: DHA (docosahexaenoic acid), EPA (eicosapentaenoic acid) and ALA (alpha linolenic acid) (Flax Council of Canada, 2003). Omega-3 fatty acids (DHA); The fatty acid profile of the egg yolks is altered by changing the feed the hens receive by making it rich in omega-3s, typically from flaxseed, oily fish like "salmon, trout and sardines" or sea algae. The resulting eggs that the hens lay contain large amounts of omega-3s, and in return small amounts of saturated fats. It's important for the proper growth and maintenance of brain cells. Higher intakes of DHA and EPA in oily fish, are also protects against heart disease. Whole eggs in the carton, labeled DHA/Omega-3-enriched". Depending on the brand, omega-3 eggs can contain up to 350 mg omega-3s per egg, compared with 60 mg in a regular egg.

Being a good source of ALA which is an essential fatty acid – must be obtained from food because the body can't produce it – there is a daily requirement for it. Adult women need 1,100 mg a day and men require 1,600 mg. One omega-3 egg supplies 20 to 30 per cent of a day's worth of ALA.

3.5. Phytosterol esters (Plant Sterol and Stanol Esters)

Plant sterols and stanols are phytosterols—essential components of plant membranes—that resemble the chemical structure of animal cholesterol and proceed similar cellular functions in plants (Katan et al., 2003; Awad and Fink,2000). Many fruits, vegetables, nuts, seeds, cereals, legumes, vegetable oils, and other plant sources contain low or natural proportions of sterols (Piironen et al., 2003; FDA, 2006). Stanols is present in smaller quantities in many of the same sources (FDA, 2006). Cholesterol is obtained when processes occur in the human body such as liver synthesis and intestinal absorption and this distinguishes it from plant sterols and stanols as they can only be obtained through dietary sources (Cater and Grundy,1998). Plant sterols/stanols are known for their cholesterol-lowering properties (Heinemann et al., 1991; Miettinen et al., 1995; Normén et al., 2000), they may be consumed daily, but the quantities are often not sufficient to have significant cholesterol-lowering effects (Cater and Grundy,1998). So these compounds are incorporated into the so-called functional foods (Diplock,1999). In order to more easily incorporate plant sterols and stanols in foods that contain a relatively high percentage of fats (e.g., spreads and salad dressings), these plant components are extracted from vegetable oils so that their chemical composition is modified after that, forming esters (Schweitzer et al., 2002).

The new food products, with the added benefits of sterols / stanols esters, are a healthy alternative to saturated fats and high-cholesterol products like butter (Lewis, 2006). Plant sterol/stanol esters have also been incorporated in low-fat foods including bread and cereals, low-fat milk, and low-fat yogurt (Katan et al., 2003; Pouteau et al., 2003; Noakes et al., 2005). Fruit juice, such as orange juice containing free or “unesterified” plant sterols, are also available in the US (Katan et al., 2003; Devaraj et al., 2006; Devaraj et al., 2004). Food sources do not differ much in their effectiveness (Bhattacharya,2006). Free sterols/stanols can have the same effects on blood cholesterol as esterified forms (Katan et al., 2003).

The American Heart Association (AHA) in its 2006 Diet and Lifestyle recommendation stated that individuals should consume plant sterols / stanols daily from a variety of foods and beverages - just as using cholesterol-lowering medications to lower harmful cholesterol from these products (Table 3).

Table 3: Examples of Plant Sterols and Stanols.

Class/Components	Source†	Potential Benefit
Free Stanols/Sterols†	corn, soy, wheat, wood oils, fortified foods and beverages	may reduce risk of CHD
Stanol/Sterol Esters†	fortified table spreads and salad dressings, stanol ester dietary supplements	may reduce risk of CHD

†Examples are not an all-inclusive list

3.6. Soybeans

Soy has aroused great interest to be included in the human diet being a rich source of high-quality protein and phytochemicals. Where the FDA indicated that soy protein, consumed with a diet low in saturated fats and cholesterol, reduces coronary heart disease to some extent. It’s believed that part of the amino acid profile of Soy differs from that of the amino acid profile in animal protein. the amino acids of soy protein work to lower the level of harmful cholesterol.

Soybeans contain phytochemicals essential for human health such as phytoestrogens, mainly, isoflavones (genistein and daidzein), saponins and phytosterols. However, isoflavones have many of health benefits, which include the prevention and treatment of cardiovascular diseases, cancer, osteoporosis, as well as relief of unpleasant pre- and post-menstrual symptoms.

Traditional soy foods prepared from whole soybeans fall into two categories: non-fermented and include (soy milk, fresh green soybeans, whole dry soybeans, soy nuts, soy sprouts, whole-fat soy flour and tofu)

(Golbitz, 1995).The other category is fermented such as tempeh, natto and soy sauce are richer in aglycone isoflavones and total isoflavones than unfermented soy (Wang& Murphy, 1994).

3.7. Tomatoes and tomato products

Tomatoes and all of their products; whole fresh or canned tomatoes, crushed tomatoes, diced tomatoes, tomato paste, tomato soup (low-salt), juices, salsa, gazpacho, and catsup contain many bioactive components, including those that act as antioxidants, such as vitamins C, E, and many carotenoids.

Lycopene is the most abundant (about 80-90%) as it has the highest natural antioxidant carotenoid (Liana et al., 2009). The antioxidant effect of lycopene is beneficial in disease prevention for both cardiovascular disease and prostate cancer. In regard to CVD, lycopene and tomatoes could possibly reduce the disease development by reducing inflammation, inhibiting cholesterol synthesis, or improving immune function (Petr and Erdman, 2005). With prostate cancer, several epidemiological studies have associated tomato consumption with a decreased risk of prostate cancer (Jain et al., 1999; Giovannucci et al., 2002).

Whereas biotechnology has helped inject lycopene into some foods with positive nutritional effects on health.

3.8. Probiotics and Prebiotics

3.8.1. Probiotics foods

The GI tract is colonized with an enormous number of different types of microorganisms that are somewhat affected by the food consumed. Foods containing live microorganisms, which actively enhance the health of consumers by improving the balance of microflora in the gut when ingested live in sufficient numbers, are called probiotic foods. Lactobacillus and bifidobacteria are the most common probiotic bacteria. Traditionally, probiotics have been added to yogurt and other fermented foods and have recently been incorporated into beverages, as well as marketed as supplements in the form of tablets, capsules, and freeze-dried preparations.

Some examples of probiotics are yogurt, sour cream, powdered milk, kefir, buttermilk, frozen desserts, fermented soy products (i.e., tempeh) and fermented vegetables include unpasteurized pickled vegetables, such as dill pickles, kimchi, and sauerkraut. Intaking probiotics have been shown to have health effects, including; lowering cholesterol, protecting against gastrointestinal diseases, alleviating lactose intolerance, and strengthening immunity, in human studies, in addition to its role in reducing the risk of rotavirus-induced diarrhea and colon cancer (Roberfroid, 2000).

3.8.2. Prebiotic foods

Prebiotics are non-digestible food ingredients that stimulate the growth and activation of one or more types of bacteria in the colon. Soy oligosaccharides, "polymers of sugar molecules" and inulin-type fructans, are two types of prebiotics

The health benefits of prebiotics are: Relieving constipation, suppressing diarrhea, reducing the risk of osteoporosis, and atherosclerotic cardiovascular disease associated with atherosclerosis associated with dyslipidemia and insulin resistance, obesity, and possibly type 2 diabetes (Roberfroid, 2000).

3.9. Nuts

While nuts are a delicious snack, they help you feel full and may help boost heart health, where they are good sources of monounsaturated fatty acids (healthy fats), vitamins" B3, B6, niacin and folate", minerals, and antioxidants "vitamin E". Also nuts are among the most concentrated sources of magnesium, as its deficiency is a symptom of "metabolic syndrome" and insulin resistance. They play a role in controlling blood pressure. Examples of nuts include; cashews and almonds, walnuts, pecans, pistachios, peanuts, hazelnuts, chestnuts, and brazil nuts.

Walnuts and flaxseed are rich in omega-3 fatty acids, and they are a type of polyunsaturated fat (PUFA). These PUFAs can help improve cholesterol levels, lower blood pressure, and reduce the risk of developing blood clots. On

the other hand, almonds and pecans are nuts high in monounsaturated fats (MUFA), which can improve insulin sensitivity. Like PUFAs, MUFAs also help improve your cholesterol.

3.10. Leafy Greens

Leafy greens like; Spinach, collard greens, kale, broccoli, broccoli rabe, broccoli sprouts, arugula, and other leafy greens offer significant health benefits, including reduced risk of obesity, heart disease, high blood pressure, and mental decline (Morris et al., 2018).

Leafy greens consist of carotenoids and isothiocyanates, which protect cells from cancer, sulforaphane, and apigenin, which provide protection for the heart and lutein, which are essential in preventing cataracts, and age-related macular degeneration (reduces blindness in the elderly), and zeaxanthin boosts immunity.

Leafy greens are a unique store of vitamins, minerals, fibers, and phenolic compounds, along with mineral nutrients such as iron and calcium, more than basic food grains. Moreover, they are rich in potassium, which offers improved muscle function. Potassium is also an ingredient in helping fight off stress, fatigue, and other conditions that lead to lower energy levels. As a functional food, leafy greens are easy to find and easy to add to your diet. Not to mention that leafy vegetables are the only natural sources of folic acid, which contain a higher percentage of Moringa oleifera leaves compared to other leafy and non-leafy vegetables.

3.11. Cocoa

Chocolate is a functional food, as the cocoa in chocolate contains polyphenols "mainly flavonoids", which boost levels of endorphin and serotonin. It also has a similar effect as a low dose of aspirin by thinning the blood. Flavonoids, including catechin, epicatechin, and procyanidins predominate in antioxidant activity (David et al., 2011). Dark chocolate contains flavonoids are more compared to milk chocolate.

Cocoa butter also contains stearic acid and small amounts of plant sterols. Studies of stearic acid in chocolate have shown a cholesterol-neutral response in people, who consumed the chocolate-enriched diet. Magnesium is a mineral found in significant amounts in chocolate products. Examples of functional foods, bioactive food components, and potential health effects are provided in (Table 4).

Table 4. Examples of functional foods, bioactive food components, and potential health effects.

Examples of functional food components †		
Class/Components	**Source †**	**Potential benefit**
Carotenoids		
Alpha-carotene	carrots	Neutralizes free radicals that may cause damage to cells
Beta-carotene	various fruits, vegetables	Neutralizes free radicals
Lutein	green vegetables	Contributes to maintenance of vision
Lycopene	tomatoes and tomato products (ketchup, sauces, etc.)	May reduce risk of prostate cancer
Zeaxanthin	eggs, citrus, corn	Contributes to maintenance of vision
Collagen Hydrolysate		
Collagen Hydrolysate	gelatin	May help alleviate some symptoms associated with osteoarthritis
Dietary Fiber		
Insoluble fiber	wheat bran	May reduce risk of breast and/or colon cancer
Beta glucan‡	oats	Reduces risk of cardiovascular disease (CVD)
Soluble fiber‡	psyllium	Reduces risk of CVD
Whole grains‡	cereal grains	Reduce risk of CVD
Fatty Acids		

Examples of functional food components †		
Class/Components	**Source †**	**Potential benefit**
Omega-3 fatty acids, DHA/EPA	tuna; fish and marine oils	May reduce risk of CVD and improve mental, visual functions
Conjugated linoleic acid (CLA)	cheese, meat products	May improve body composition, may decrease risk of certain cancers
Flavonoids		
Anthocyanidins	fruits	Neutralize free radicals, may reduce risk of cancer
Catechins	tea	Neutralize free radicals, may reduce risk of cancer
Flavanones	citrus	Neutralize free radicals, may reduce risk of cancer
Flavones	fruits/vegetables	Neutralize free radicals, may reduce risk of cancer
Glucosinolates, Indoles, Isothiocyanates		
Sulphoraphane	cruciferous vegetables (broccoli, kale), horseradish	Neutralizes free radicals, may reduce risk of cancer
Phenols		
Phytic acid	Legumes and whole seed grains	Lower blood glucose
Ferulic acid	fruits, vegetables, citrus	Antioxidant like activities, may reduce risk of degenerative diseases like heart disease and eye disease
Plant Stanols/Sterols		
Stanol/stanol ester‡	corn, soy, wheat, wood oils	May reduce the risk of coronary heart disease (CHD) by lowering blood cholesterol levels
Prebiotic/Probiotics		
Fructo-oligosaccharides (FOS)	Jerusalem artichokes, shallots, onion powder	May improve gastrointestinal health
Lactobacillus	yogurt, other dairy	May improve gastrointestinal health
Saponins		
Saponins	soybeans, soy foods, soy protein-containing foods	May lower LDL cholesterol, contains anticancer enzymes
Soy Protein		
Soy Protein‡	soybeans and soy-based foods	1 ounce per day may reduce risk of heart disease
Phytoestrogens		
Isoflavones, daidzein, genistein	soybeans and soy-based foods	May reduce symptoms of menopause, such as hot flashes
Lignans	flax, rye, vegetables	May protect against heart disease and some cancers; lowers LDL cholesterol, total cholesterol, and triglycerides
Sulfides/Thiols		
Diallyl sulfide	onions, garlic, olives, leeks, scallions	Lowers LDL cholesterol, maintains healthy immune system
Allyl methyl trisulfide, dithiolthiones	cruciferous vegetables	Lowers LDL cholesterol, maintains healthy immune system
Tannins		
Proanthocyanidins	cranberries, cranberry products, cocoa, chocolate	May improve urinary tract health and reduce risk of CVD

†Examples are not an all-inclusive list.

‡ FDA-approved health claim established for the component.

4. Safety considerations

Safety and efficacy are the cornerstones for evaluating functional foods. Consumption of functional foods must not compromise healthy feeding habits and, no matter what, one necessary condition is that safety be guaranteed for the whole population (Palou et al., 2003).

Functional foods play a role in protecting against disease and strengthening health, but safety must be a priority. Safety concerns have recently been raised, particularly with regard to the seemingly indiscriminate random addition of botanicals to foods. Currently, a large number of “functional” bars, beverages, cereals and soups are being enhanced with botanicals, some of which may harm to certain consumers. Safety issues related to herbs are complex, but the issue of the interaction between drugs and herbs is receiving increasing attention (Hasler, 2002). Safety is guaranteed by applying various regulations responsible for controlling any novelty in food ingredients and the obtaining processes (Palou et al., 2003). Scientific evidence Studies should be sufficient to adequately prove the effectiveness of functional foods (Hasler, 2002). The issue of evaluating their effectiveness is only at a preliminary stage. Criteria for validating "health claims" must be addressed more clearly (Palou et al., 2003).

Therefore, developing safe and effective functional foods is the goal of improving the quality of life through selecting that positively impact consumer health and well-being (Milner, 1999; Palou et al., 2002).

5. The future of functional foods

The foods already on the market represent a small fraction of the potential for functional foods. Today’s science and technology can be used to provide many additional functional foods (Sharanya Rani and Penchalaraju, 2016).

The future faces challenges such as scientific and technological developments and regulatory measures for so-called "functional foods", which increase health benefits for consumers that can reduce chronic diseases or improve health, thus reducing health care costs and improving quality of life, which positively affects consumers' well-being. It strengthens growth and development and provides precision in performance.

Clearly and categorically convincing the public that health benefits do exist influences the future acceptance of functional foods, so the industry should be completely transparent in its health claims, without exaggerating the truth.

6. Conclusion

Today, functional foods represent a large-scale field of research and promotion in food and nutritional sciences The functional properties of many traditional foods are researched and studied on a hand, and the development and discovery of new useful food products on the other hand. Some examples of these foods are fruits, vegetables, whole grains, fortified foods and drinks, and some nutritional supplements. Functional foods are used to reduce a proportion of human diseases because they contain functional components that have properties such as antimicrobial activity, antioxidant and anti-cancer.

Rigorous studies of safety and efficacy must be based on strong scientific evidence when studying any health benefits attributable to functional foods. Interactions with other dietary components and potential adverse interactions with pharmaceutical agents must be clearly imparted. It should be noted that functional foods are not a magic wand to solve health problems, that is, consumers must be careful of the many promoted or implied benefits of these foods, and that there is no coordinated regulation or application of current regulations in the field of functional foods.

Conflict of interest

The author declares no conflict of interest.

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