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Review
Biologically Active Compounds of Plant Foods: Prospective Impact on Human Health and Dilemmas Associated with these Compounds

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Abstract
Several plant foods grown in Ethiopia contain significant amounts of biologically active compounds, which have both detrimental and beneficial effects on health. Such compounds as phytic acid, phytohaemagglutinins, tannins, saponins, enzyme inhibitors and α-galactosides provide health benefits. Benefits include reduced risks of heart and renal diseases, lower glycemic index for persons with diabetes, reduced risks of cancer and increased bifidobacteria population in the colon. On the other hand, other biologically active compounds impair health by destroying nutrients or reducing the uptake of essential elements through different mechanisms and giving astringent taste, odor, flavor, which can cause adverse physiological responses. Harmful compounds interfere with normal growth, reproduction, or health and reduce protein and carbohydrate utilization. The health benefits of selected substances from Ethiopian food crops need to be studied. Active compounds need to be isolated, identified and produced to explore their potential benefits with emphasis to develop new products and technologies. This paper is a review of available information on biologically active compounds of plant foods. Their adverse effects on health, their benefits and their potential to combat common nutrition-related ailments such as cancer and cardiovascular diseases are discussed.

Key words: Adverse effect; ecologically active compounds; plant foods; human health

1. Introduction
The majority of the world's population depends on plants for food. In the new millennium, researchers in Africa need to investigate, in a more holistic approach, the relationship between food and health. The idea of diet and health is, of course, not new and dates back to Hippocrates (400 BC), who coined the phrase 'Let food is thy medicine and medicine is thy food'. In the industrialized world, several factors, including the aging population, ever-increasing health-care costs, consumer demand for healthier foods, and food regulation, have been significant driving forces in moving functional foods into the corporate mainstream (Grusak, 2002). Current recommendations suggest that the intake of grains, fruits, and vegetables be increased for better health and management of chronic diseases such as cardiovascular diseases, diabetes and cancer (Lila and Raskin, 2005). However, there are concerns that the high intake of these foods may also increase the intake of bioactive compounds present in these foods (Morgan and Fenwick, 1990). The health beneficial effects of grains, fruits, and vegetables have been attributed in part to some of their naturally occurring bioactive compounds (Adlercreutz *et al.*, 1991; Messina and Barnes, 1991; Caragay, 1992). Bioactive compounds are chemicals that naturally occur in plants and plant-derived foods. They include a group of nutritive components found in herbs, fruits, vegetables, grains, legumes, nuts and spices. Many bioactive compounds function as crucial components in the natural defense system of their host plants, defending against infections and microbial invasion. Others give plants their flavors, aromas and pigments. Bioactive compounds are any food ingredients that may provide a health benefit which prevent or delay the onset or continuation of chronic deceases in humans and animals

beyond the nutrients they contain (Guhr and LaChance, 1997; Hasler, 1998; Shimelis, 2005).

Some of these beneficial chemicals block various hormonal actions and metabolic pathways that are associated with the development of cardiovascular disease and cancer, and other chemicals stimulate protective enzymes. The plant food chemicals appear to work alone and in combination, and perhaps in conjunction with vitamins and other nutrients in food, to prevent, halt or lessen disease (Duke, 1992). .In addition, they can reduce the risk of developing diabetes and help lower blood cholesterol levels, which can reduce in turns the risk of heart disease. All of the above claims are due to plant-derived "super nutrients," called biologically active compounds, which help to blur the line between food and medicine (Slavin, 2004; Shimelis, 2005).

The diet and health benefits of plant food crops as a basis for improving their nutritional quality need to be systematically evaluated through modern plant breeding and food processing technologies. Currently, research on exploring the potential of bioactive compounds is active in developed countries. Researchers constantly strive for and decipher the many ways of using biologically active compounds in foods and drugs, which might be used as front-line defense against many life-threatening diseases. As scientists continue to identify individual constituents in plants, they also discover more human health benefits. Some of the biologically active compounds are available on market such as flavanols soy capsule for relief of menopausal symptoms.

Biologically active compounds from plant foods for instance, raffinose family sugars (verbascose, stachyose and raffinose), phytohemagglutinins, phytic acid, phenolic compounds, saponins, trypsin inhibitors, phytoestrogens and lignanas attract considerable interest as a result of their diverse properties, both deleterious and beneficial (Ali and Muzquiz, 1998). The adverse effects of these bioactive compounds have always been associated with a number of substances which inhibit specific physiological function of humans and animals including digestion, enzyme activity, metabolism and absorption of nutrients. Active compounds from plant foods negatively affect the nutritive value of plant foods through direct and indirect reactions. Phytochemicals inhibit protein and carbohydrate digestibility; interfering with mineral bioavailability, induce pathological changes in intestine and liver tissue thus affecting metabolism, inhibit a number of enzymes and they bind nutrients making them unavailable (Bressani, 1993; Shimelis and Rakshit, 2007). A number of biological active compounds are under study for their potential health benefits in different countries. Different food processing methods are used for the reduction/removal of these bioactive compounds for consumption and threshold levels at which undesirable components may exert adverse effects must be established.

Grains, oilseeds, and specialty crops are widely grown in Ethiopia. Most of these commodities have the potential to be processed into functional foods/nutraceuticals for domestic and global markets. Along with enhancing the nutritive value and functional properties of common crops, there has been a trend towards value-added processing and extraction of the most nutritionally valuable constituents of biologically active compounds. Current research indicates that phytochemicals are have great potentials to be used in foods and drugs aimed at front-line defense against many life threatening diseases. However, research and development on bioactive compounds is at its infancy because very little is known about their health benefits. This resulted in minimal use of these products. The objective of this paper was to describe diverse benefits and dilemmas associated with biologically active compounds from plant foods.

2. Potential Health Benefits of Biologically Active Compounds

Biologically active compounds have health benefits which, interestingly, appear to be similar to those suggested for the dietary fibers in fruits, vegetables and other crops (Table 2). Recent research on biologically active compounds is underway including application of biologically active compounds as nutraceuticals, functional foods, cosmetics and food processing industries (Grusak, 2002). Additionally, studies are under investigation to indicate the main groups of bioactive compounds giving a description of their localization, chemical properties and biological actions.

2.1 Oligosaccharides

Oligosaccharides are one of the most popular functional food components in South East Asia and exported to several countries including USA. The consumer products containing oligosaccharides included soft drinks, cookies, cereals and candies. Physiologically functional oligosaccharides meet two specific requirements: (a) they are not digestible by human digestive juices and (b) they are preferentially consumed by beneficial intestinal bacteria, bifidobacteria, in the colon.

Ingestion of oligosaccharides increases the bifidobacteria population in the colon, which in turn contributes to human health in many ways. The benefits of oligosaccharides ingestion arise from increased population of indigenous bifidobacteria in the colon which by their antagonistic effect, suppress the activity of putrefactive bacteria and reduce the formation of toxic fermentation products. The toxic metabolites formed during fermentation of foods in the colon include ammonia (liver toxin), amines (liver toxin), nitrosoamines (carcinogens), phenols and cresols (cancer promoters), indole and skatole (carcinogens), estrogens (suspected carcinogens or breast cancer promoters), secondary bile acids (carcinogens or active colon cancer promoters), aglycones (often mutagenic), and others (Hylemon and Glass, 1983; Hespell and Jeffrey-Smith, 1983; Kanbe, 1988; Mitsuoka, 1990, Hideo, 1994).

Health benefits of ingesting oligosaccharides are multifaceted. They proliferate bifidobactria and reduce detrimental bacteria (Wada *et al*., 1991), reduce toxic metabolites and detrimental enzymes (Saito *et al*., 1992), prevent pathogenic and autogenous diarrhea (Kurmann and Rasic, 1991), prevent constipation (Matsunami *et al*., 1992), protect liver function (Takasoye *et al*., 1990), reduce blood pressure (Masai *et al*., 1987), prevent cancer (Hirota, 1990) and produce nutrients (Hughes and Hoover, 1991). Reduction of toxic metabolites and detrimental enzymes by ingesting oligosaccharides has been shown in human tests and *in-vitro* human-feces culture tests (Kato *et al*., 1992; Saito *et al*., 1992). Ingesting oligosaccharides, which promotes bifidobacteria, reduces toxic metabolites, which in turn improves the detoxifying load of the liver (Takasoye *et al*., 1990).

2.2 Phytic acid

Phytic acid has gained significance as a naturally occurring antioxidant (Empson *et al*., 1991). The potential beneficial effects of phytic acid, such as delayed postprandial glucose absorption (Yoon *et al*., 1983), reduced plasma cholesterol and triglycerides (Katayama, 1995), reduced proliferation in different cell lines, including erythroleukaemia human mammary cancer cells (Shamsuddin, 1995) and its anti-cancer function have recently been discussed in the literature. *In vitro* studies of both human and rodents' cancer cell lines in research laboratory demonstrate that phytic acid reduces cell proliferation rate in all of the cell lines tested (Shamsuddin, 2002).

It is suggested that phytic acid prevents dental caries and platelet aggregation, plays a role in the treatment of hypercalciuria and kidney stones, and serves as antidote against acute lead poisoning, primarily due to its mineral-binding ability (Graf and Eaton, 1990). Phytic acid is found mostly in legumes and appears to possess anti-carcionogenic properties. This may be due to a number of factors including the recognized 'binding' properties of phytate. For this to occur successfully it is important that the integrity of phytic acid is preserved in the colon, which is a profuse microbial ecosystem via metabolization of colonic bacteria. According to most recent studies of phytic acid as a major component of cereal grains and beans is considered an important antioxidant and is increasingly used in various therapeutic diets for its protective effect on cancer of the colon and rectum (Steer and Gibson, 2002).

2.3 Saponins

The saponin content of foods is of interest because dietary saponins have been shown to lower plasma cholesterol concentrations in several species of animals (Oakenfull *et al*., 1979) and may be important in human diets to reduce the risk of heart disease (Potter *et al.,* 1980). Saponins have antioxidant properties and are used for health care treatments (Duhan *et al.,* 2001). Recent experimental investigations suggest that saponins reduce cholesterol and serve as anticancer and stimulate the immune system. Anticancer properties of saponins appear to be because they have antioxidant properties and they modulate the immune system and regulate cell proliferation (Rao, 1996). Animals have reduced cholesterol levels when fed either soy protein, daidzein (a soy isoflavone) or soy germ (Hendrick, 1999).

2.4 Other Benefits of Biologically Active Compounds

Biologically active organosulfur compounds contain various forms of sulfur, which give them their characteristic pungent aroma. These compounds include glucosinolates, thiosulfonates, phenols and polyphenols. They are often accepted by Ethiopians because cooking intensifies their odor and strong taste. Paradoxically, cooking can also boost their protective powers. The organosulfur group includes the cruciferous vegetables, such as bok choy, broccoli, brussels sprouts, cabbage, kale and turnips, and the onion and mustard families (Duke, 1992; Awika and Rooney, 2004). Glucosinolates are found in cruciferous vegetables and the mustard family. Broccoli glucosinolates are thought to activate protective liver enzymes that detoxify potential carcinogens and facilitate estrogen conversion into estrogen conjugates that are eliminated from the body (Kall, 1997). Glucosinolates are converted into several biotransformation products in the human body, particularly indole-3-carbinol, thiosulfonates and isothiocyanates. Thiosulfonates are also most notably found in onions and garlic as well as in chives, leeks and shallots. When the plants are cut or smashed, sulfur compounds release biotransformation products including allicin, ajoene, allylic sulfides, vinyl dithin and D-allyl mercaptocysteine. Some of these are considered antiatherosclerotic and anticancer agents. Others are antibacterial, antiviral and antifungal (Lash, 1999). Garlic and onions, like their cruciferous relatives, can also selectively alter liver detoxification enzyme systems to reduce toxic by-products (Brady, 1991). Finally, garlic powder has been shown in numerous studies to lower cholesterol, often by as much as 10 percent (Silagy and Neil, 1994).

Phenols and polyphenols are among organosulfur compounds which have large family members of phytonutrients. These include rosemary, culinary herbs, red, blue and purple pigments found in fruits, vegetables, tea and red wine. All have a long history of use as food preservatives. In humans, they act as antioxidants, antifungals, anti-infectives and antiseptics (King and Young 1999; Tabak, 1999). Polyphenols, have an even wider range of biological activities due to their polyphenol content. Specific examples include apples, blueberries, cranberries, eggplants, red currants, grapes, grape juice, purple bell peppers, raspberries, red wine, and green and black tea. Polyphenols found primarily in citrus fruits are collectively known as bioflavonoids. These include rutin, kaempferol, quercetin, hesperidin and narigenin. They are considered to have antihistaminic, anti-inflammatory, antioxidant, anticlotting, antitumor and vascular effects (Formica and Regelson, 1995). A distinct group of polyphenols known as the flavan-3-ols includes anthocyanidins, proanthocyanidins, catechins and tannins. These have been extensively studied for their antioxidant, anticancer, antitumor and cardioprotective effects (Sato, 1999).

Hundreds of studies alone have been done on green tea catechins to assess their cardiovascular effects (Tijburg, 1997). Red wine, grape juice, pine bark and grape seed extracts have been studied for their anticlotting, antioxidant, cardiovascular and anticancer effects (Renaud and De Lorgeril 1992). Biologically active compounds are currently available in medical stores including garlic powder and others as health foods produced by American and South East Asian countries. Health benefits of some biologically active compounds are presented in Table 1.

3. The Detrimental Effects of Biologically Active Compounds

3.1 α-Galactosides

α-galactosides are oligosaccharides of the raffinose family of sugars, which include raffinose, stachyose and verbascose.

They contribute to flatulence production in humans and mono-gastric animals because of lack of the necessary α-galactosidase enzyme which helps to break down raffinose-series oligosaccharides during consumption of plant foods (Onigbinde and Akinyele, 1983). The raffinose family sugars then pass into the large intestine where microbial fermentation converts them into CO_2, H_2 and CH_4 gases, the main components of flatus (Becker *et al.*, 1974; Rao and Belavady, 1978). A number of investigators have demonstrated that the oligosaccharides, raffinose and stachyose, are the principal causes of flatulence in human and animal studies (Rackis *et al.*, 1970; Calloway *et al.*, 1971; Reddy *et al.*, 1980).

Table 1. The best known biologically active compounds and their benefits and sources

Biologically active Compounds	Potential Health Benefits	Plant Food Source
Anthocyanidins	Reduce risk of heart disease	Grapes, raspberries, blueberries, cherries
Carotenoids	Encourage normal cell growth, reduce risk of cancer	Yellow-orange vegetables and fruits, red fruits, dark green leafy vegetables
Catechins	Reduce risk of cancer	Green tea
Chalcones	Reduce risk of cancer	Licorice
Coumarins	Reduce risk of cancer	Carrots, caraway, celery, parsley
Curcumins	Reduce risk of cancer	Turmeric, ginger
Diallyl sulfide, disulfides, trisulfides	Reduce risk of cancer, of heart disease, antimicrobial	Onions, garlic, chives, leeks
Dithiolthiones	Reduce risk of cancer	Cruciferous vegetables
Ellagic acid	Reduce risk of cancer	Grapes, strawberries, raspberries, nuts
Flavonoids	Reduce risk of heart disease and cancer	Most fruits and vegetables
Glucarates	Reduce risk of cancer	Citrus, grains, tomatoes, bell peppers
Indoles, isothiocyanates	Reduce risk of cancer	Broccoli, cabbage, cauliflower, radish
Isoflavones	Lower blood cholesterol, risk of cancer, heart disease and osteoporosis	Soy foods (soybeans, tofu, soy milk, soy protein powder)
Alpha-linolenic acid	Lower blood cholesterol, reduce hypertension, reduce risk of heart disease, reduce risk of cancer, reduce inflammation, improve immune system	Vegetable oils (canola or soybean), flax seed
Lignans	Lower cholesterol and risk of cancer	Soybeans, flax seed, sesame
Liminiods	Reduce risk of cancer	Citrus, ginger, liquorice
Phenolic acids	Reduce risk of cancer	Most fruits and vegetables, teas and herbals; nuts, whole grains
Phthalides, polyacetylenes	Reduce risk of cancer	Caraway, celery, cumin, dill, fennel, parsley
Phytates	Reduce risk of cancer	Grains, legumes
Phytosterols	Reduce risk of cancer	Nuts, seeds, legumes
Saponins	Reduce risk of cancer	Beans, herbs, licorice root
Terpenoids	Reduce risk of cancer	Cherries, citrus, herbs (basil, oregano, thyme, sage)

Source: Guhr and LaChance (1997); Broihier(1999)

The most common form is the trisaccharide raffinose, the tetrasaccharide stachyose and the pentasaccahride verbascose (Yasushi *et al*., 1993). The fact that plant seeds stimulate intestinal gas formation has been recognized for many years and is one of the main reasons why people limit their consumption of legumes. Consequently, the presence of these sugars in plant food seeds is one of the major constraints in their full utilization as human food (Shimelis and Rakshit, 2005).

3.2 Phytic Acid

Phytic acid is the major phosphorus storage compound in plant seeds and can account for up to 80% of seed total phosphorus. The remaining phosphorus is represented by soluble inorganic phosphate and cellular phosphorus. Most of the phytic acid in plant foods is located in the cotyledons and not in the seed coat (Reddy *et al*., 1982). Because of its high density of negatively charged phosphate groups, phytic acid forms very stable complexes with mineral ions rendering them unavailable for intestinal uptake. As the phytic acid content of the diet increases, the intestinal absorption of zinc, iron and calcium decreases (Lopez, 2002). Zinc is an essential trace element involved in the immune function, in the activation of many enzymes and in growth. However, zinc deficiency has been recognized in East and Great Lakes Region of Africa due to inadequate dietary supply, abnormal blood losses or high physiological requirements for growth, puberty, pregnancy and lactation. Phytic acid strongly binds zinc in the gastrointestinal tract and reduces its availability for absorption and re-absorption in physiological pH range than other minerals (Flanagan, 1984). The amount of phytic acid, the type and amount of protein and the total zinc content have a major impact on the amount of zinc absorbed from plant foods.

Phytic acid is therefore, thought to be responsible for reducing the mineral bioavailability (Erdman and Forbes, 1981). Generally, phytic acid reduces the bioavailability of minerals, and the solubility, functionality and digestibility of proteins and carbohydrates. Manufacturing processes (kneading, soaking, fermentation, baking, toasting, extrusion-cooking) of plant foods can increase mineral bioavailability.

3.3 Saponins

The better-known biological effects of saponins are their capacity to cause lysis of erythrocytes (Khalil and El-Adawy, 1994), and to make the intestinal mucosa permeable (Johnson *et al.*, 1986). Saponins impart undesirable bitter and astringent characteristics to plant foodstuffs. They are foam producing glycosides and are detected by their hemolytic activity and surface-active properties.

3.4 Tannins and Phytohaemagglutinins

Tannins occur widely in plant foods specifically in cereal and legume seeds (Haard and Chism, 1996). These compounds are concentrated in the bran fraction of grains (Salunkhe *et al*., 1990). Tannins inhibit several enzymes and are located mainly in the seed coat. Reduction in protein digestibility due to the presence of tannins has been observed by several investigators (Elias *et al*., 1979; Bressani *et al*., 1983).

Tannin-protein complexes can cause inactivation of digestive enzymes and reduce protein digestibility by the interaction of protein substrate with ionizable iron (Salunkhe *et al*., 1990). The presence of tannins in food can therefore lower feed efficiency, depress growth, decrease iron absorption, damage the mucosal lining of the gastrointestinal tract, alter excretion of cations, and increase excretion of proteins and essential amino acids (Reddy and Pierson 1994). Dehulling, cooking and fermentation reduce the tannin content of cereals and other foods.

The biochemical nature of how the food tannins bind to food proteins is difficult to discern, primarily due to the complexity of tannin chemistry as well as the number of tannin species present in food (Sathe and

Salunkhe, 1984). Elias *et al.* (1982) found that tannin concentration was high in colored seed coats and low in white-coated plant food seeds. Moreover, there is a correlation between tannin concentration in the seed coat and trypsin inhibitor activity. The hulls have much greater amounts of trypsin inhibitor than the cotyledon. Probably most of the trypsin inhibitor activity of the hulls is attributable to tannins. Tannins inhibit the activity of trypsin chymotrypsin, amylase and lipase. Tannin-protein complexes can cause inactivation of digestive enzymes and reduce protein digestibility by the interaction of protein substrate with ionizable iron. The presence of tannins in plant food can therefore lowers feed efficiency, depress growth, decrease iron absorption, damage the mucosal lining of the gastrointestinal tract, alter excretion of cations, and increase excretion of proteins and essential amino acids (Reddy and Pierson, 1994).

Phytohaemagglutinins are proteins or glycoprotein substances, usually of plant origin, that bind to sugar moieties in cell walls or membranes and thereby change the physiology of the membrane to cause agglutination, mitosis or other biochemical changes in the animal red blood cells (Liener, 1983; Gupta, 1987). In general phytohaemagglutinins classified in to animal, plant, bacterial, fungal and virus Phytohaemagglutinins are the main toxic components in some plant foods. The toxicity of phytohaemagglutinins is characterized by growth depression in experimental animals and diarrhea, nausea, bloating and vomiting in humans (Liener, 1982). Phytohaemagglutinins have been used by immunologists for years to trigger DNA synthesis in lymphocytes, and more recently, to activate latent human immunodeficiency virus type 1 (HIV-1, AIDS virus) from human peripheral lymphocytes. Besides inducing mitosis, lectins are known for their ability to agglutinate many mammalian red blood cell types, alter cell membrane transport systems, alter cell permeability to proteins, and generally interfere with cellular metabolism (FDA, 1997). Phytohaemagglutinins, the presumed toxic agent, is found in many species of plant foods. Adverse health effects of biologically active compounds in plant foods are presented in Table 2.

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Table 2. Summary on adverse health effects of biologically active compounds present in plant foods

Biologically active compounds	Adverse health effects
Phytohemagglutinins	Growth depression, fatal, agglutination of animal red blood cells
Protease inhibitors	Pancreatic hypertrophy, dietary loss of S-amino acids, reduced protein utilization
Amylase inhibitors	Amylase inhibition, may hinder carbohydrate utilization
Flatulent factors (Oligosaccharides)	Flatus resulting in discomfort, abdominal rumblings, cramps, pain and diarrhea
Phytate	Reduced mineral bio-availability, altered protein solubility, enzyme inhibition
Oxalates	Chelation of dietary divalent cations and reduced bio-availability
Polyphenols (tannins)	Reduction in protein digestibility and utilization, inhibition of several enzymes
Cyanogens	Cyanide poisoning, acts as progoitrogens
Goitrogens	Inhibition of iodine binding to thyroidglans
Saponins	Bitter taste, foaming, hemolysis
Allergens	Several allergic reactions
Lathyrogens	Neurotoxic, nervous paralysis of lower limbs, fatal
Vicine and convicine	Haemolytic anemia (Favisms)
Off-flavors	Loss of certain amino acids, reduced product acceptability to consumers
Pytoalexins	Haemolysis, uncouple oxidative phosporylation
Estrogens	Growth inhibition, interference in reproduction
Lysionoalanine	Nephrotoxicity, reduction in available lysine, kidney cell nucleus and cytoplasm enlargement
Amino acid racemization	Generation of D-amino acids, may act as synergist to lysinoalanine in expression of nephrocytomegaly
Toxic amino acids	Structural analogs of protein amino acids, act as antimetabolites, potent inhibitors of several enzyme systems
Anti-vitamins	Increased vitamin requirements, rachitogenic, liver necrosis, muscular dystrophy

Source: Deshpande et al. (2000)

Phytohaemagglutinins are proteins or glycoprotein substances, usually of plant origin, that bind to sugar moieties in cell walls or membranes and thereby change the physiology of the membrane to cause agglutination, mitosis or other biochemical changes in the animal red blood cells (Liener, 1983; Gupta, 1987). In general phytohaemagglutinins classified in to animal, plant, bacterial, fungal and virus Phytohaemagglutinins are the main toxic components in some plant foods. The toxicity of phytohaemagglutinins is characterized by growth depression in experimental animals and diarrhea, nausea, bloating and vomiting in humans (Liener, 1982). Phytohaemagglutinins have been used by immunologists for years to trigger DNA synthesis in lymphocytes, and more recently, to activate latent human immunodeficiency virus type 1 (HIV-1, AIDS virus) from human peripheral lymphocytes. Besides inducing mitosis, lectins are known for their ability to agglutinate many mammalian red blood cell types, alter cell membrane transport systems, alter cell permeability to proteins, and generally interfere with cellular metabolism (FDA, 1997).

Phytohaemagglutinins, the presumed toxic agent, is found in many species of plant foods. Adverse health effects of biologically active compounds in plant foods are presented in Table 2.

4. Conclusion

It is evident that both health benefits and adverse effects may be attributed to biologically active compounds in plant foods. In many cases, the same interactions that make them adverse effect also are responsible for their health benefits. Overall, the most effective solutions too many major human health conditions lie in the natural components of foods we eat, rather than expensive medical intervention. The challenge is to find and incorporate a balance of the functional ingredients in everyday foods at adequate levels.

Different plant food sources, which are currently underutilized, are worth considering as a source of health-promoting biologically active compounds. Products containing many of these active compounds are emerging in developed countries, based on results obtained from several completed and ongoing studies. The scientific community has produced a growing body of evidence indicating that naturally occurring biologically active compounds are still the beast health insurance. Therefore, different strategies should be put in place in Ethiopia such initiating research activities on phytochemicals, establishing linkage among professionals, documenting endogenous knowledge on the application of phytochemicals. Current investigations have demonstrated that both adverse and health and disease-fighting benefits perhaps are attributed to biologically active compounds in plant foods. Ultimately, the greatest promise of biologically active compounds might be their ability to spark a dramatic and widespread shift in the understanding and appreciation of plant foods. With a greater understanding of biochemistry and human physiology, biologically active compounds could well drive the food and supplement the industry and can be used as potential health bodyguards in the near future. Researchers caution that choosing foods containing naturally occurring biologically active phytochemicals is still the best health insurance in order to harvest better-educated public, wealthier and more willing to self-medicate with plant foods and supplements from plant resources.

Available data on biologically active compounds are too limited to draw reasonable conclusions in the Ethiopian context. Therefore, to explore their true properties and applications, critical research results are imperative before applying them widely. Although the matter has so far remained a challenge, biologically active compounds can easily be made available and used in the near future.

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