



## The role of fruits and vegetables in nutritional and economic security

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The fruits and vegetable which were the corner stone's of health, supplying us with a wealth of vitamins, minerals fibres and carbohydrates, have assumed utmost importance after the discovery of photochemical. These are naturally found in fruits and vegetables. Therefore, garlic, ginger, broccoli and Cruciferous vegetables, beans, orange, red and dark green vegetables, citrus fruits, bael, apple, aonla etc. are highly recommended to overcome number of ailments.

The discovery of photochemical in fruits and vegetables and their strong antioxidant potential in scavenging free radicals has generated tremendous attention among scientists. Consumption of fruits and vegetables has significant health promoting effects and can reduce the incidence of cardio-vascular diseases, cancer, AIDS and various other degenerative diseases. Human health in recent years has assumed an unprecedented status. Rising pollution levels, increase in mental stress and changes in dietary habits have resulted in various forms of degenerative diseases including cardio-vascular, cancer and aging. As a result of this. There has been an alarming explosion in consumer's interest in health. A new diet health paradigm is evolving which places more emphasis on foods providing health benefits besides meeting basic nutritional needs. The tenet "let medicine and medicine be thy food" espoused by Hippocrates nearly 2500 years ago is receiving renewed interest in the present millennium.

Food is now, viewed as not only a source of minerals and vitamins for performing basic nutritional role but also as a powerful medicine which can help reduce the risk of chronic diseases. Thus, foods have been conferred a status of functional foods. The term functional food was first introduced in Japan in the mid 1980s and referred to foods containing those ingredients that aid specific bodily functions in addition to being nutritious. Significance of functional food lies in its impact in alleviating disease,

promoting health and reducing cost of health care. According to health Canada, a functional food is similar to conventional food in appearance. It is consumed as part of the usual diet and has demonstrated physiological benefits/or reduces the risk of chronic disease beyond basic nutritional functions. There have been several other terms used for functional foods such as nutraceuticals, pharma foods, designer food, smart foods, health foods etc.

Overwhelming evidence from epidemiological *in-vivo*, *in-vitro* and clinical trial data indicates that a plant based diet can reduce risk of chronic diseases, particularly of cancer. It is now an established fact that a diet based on fruits and vegetables can reduce cancer risk and reduce total low density lipoprotein (LDL) cholesterol thereby reducing the risk of coronary heart disease.

### Modern theory of disease:

#### The free radicals:

The term free radical forms the core of modern theory of disease. It is a paradox that oxygen, which is vital to life, may also contribute to human aging and illness. When oxygen is metabolized or burned by the body cells, it forms byproducts called free radicals. Free radicals travel through the cell, disrupt the structure of other molecules and result in cellular damage. Such damage is believed to contribute to aging and various health problems. The damage caused by the free radicals can range from cell damage to the ultimate cell death. Such cellular breakdown manifests



itself superficially in lines; wrinkles, dry skin, loss of elasticity and skin discolouration. On a deeper level, free radical destruction can substantially destroy the collagen and elastin support system, degrade DNA, damage vital enzymes, impair critical immune functions, and cause general tissue deterioration. Free oxygen radicals, the main type formed in living organisms, have been implicated in recent studies in more than 60 disorders, including heart disease, cataracts and rheumatoid arthritis, Alzheimer's, arthritis, hemorrhoids, Parkinson's rheumatism, heart attack, AIDS, stroke, cancer, stress/jet lag, senility, varicose vein, phlebitis and swollen extremities.

**Phytochemicals:** Many phytochemicals found in fruits and vegetables act as powerful antioxidants, protecting cells and organs from damage caused by free radicals, neutralizing their damaging effects. They are the biologically active substances in plants that give them their colour, flavour, odour and protection against plant and human diseases. Consequently, hundreds of such plant substances are being investigated now for their role in preventing cancer and other degenerative diseases. Some of the promising phytochemicals which act as antioxidants are bioflavonoids (vitamin P), phenolics, lycopene, carotenoids, antioxidant vitamins (C and E) and glucosinolates.

**Antioxidants :** Another term for antioxidants is free radical scavengers. The term scavenger refers to their ability to provide electrons so that the free radical can attach itself to the antioxidant electron and be rendered harmless before it can attach itself to a so called "healthy" radical and begin the destructive chain reaction. Antioxidants have been found to interfere with virtually every stage of cancer growth.

**Antioxidant therapy for AIDS :** Scientists have now shown that antioxidants and other nutrients may be beneficial in delaying initial episodes of general immune disorders in some patients by extending the period between HIV infection and appearance of clinical symptoms of AIDS. These nutrients may also be of benefit in combined therapy with antiviral drugs and may allow use of these drugs in lower doses, thus, limiting drug toxicity and decreasing production of drug-resistant HIV strains. Animal and human studies have shown beneficial effects of the antioxidants vitamin E and beta-carotene and other nutrients in slowing progression from HIV infection to AIDS and in decreasing symptoms.

**Indirect versus direct antioxidants:** Direct antioxidants, such as vitamins C and E, neutralize dangerous free radicals to which cells are exposed or that are generated

by cells themselves before free radicals can harm cells. In this process, a direct antioxidant molecule binds to a free radical. Certain antioxidants alter cancer at its inception by blocking the enzyme that activates cancer genes or by preventing various substances from cancer causing agents called carcinogens. Other antioxidants stop carcinogens from damaging cells, tissues and organs, or help the body produce enzymes that destroy carcinogens. Still others suppress the spread of cancer by interfering with the reproduction of cells that already have been exposed to carcinogens. They also may reduce the risk of coronary artery disease. They have been found to lower blood pressure and cholesterol levels as well as block the oxidation of bad cholesterol (LDL). Radical molecule, rendering it harmless and thus, protecting cells from damage. Once the direct antioxidant reacts with a radical, the antioxidant is destroyed and cannot be used again.

The indirect antioxidants work as a catalyst. It does not neutralize free radicals directly, but rather boosts the body's own elaborate antioxidant systems that exert ongoing and prolonged antioxidant activity. This is a broad spectrum of activity, cycling over and over again, that removes many free radicals. It is like an "army" of antioxidants ready to neutralize free radicals over a period of time, and continues to be effective even after the indirect antioxidant has left the body.

**Antioxidant vitamins:** One antioxidant vitamin is vitamin C (ascorbic acid). It is soluble in water and can readily enter cells and tissues. Studies in large populations suggest that high intakes of vitamin C are associated with reduced risk for several chronic diseases. Human beings receiving about 300 mg or more per day, on average live 6 years longer than those who receive less than 50 mg of vitamin C daily. Another antioxidant vitamin is vitamin E. (alpha tocopherol). It is a fat-soluble vitamin and there is ample evidence of health benefit from high intakes of vitamin E.

**Antioxidant rich fruits and vegetables :** The diverse climate of our country offers a variety of fruits and vegetables in plenty which are loaded with these antioxidants. However, what is lacking is the knowledge of their presence and their efficient consumption in diet. This ignorance is further accentuated by growing eating out habits of junk foods in cosmopolitan cities. The main aim of the paper is to create awareness among masses that diet alone contains an optimal mix of antioxidants which can give us health benefits. A comprehensive list of some of important fruits and vegetables, which have significant health promoting effects.

**Allium vegetables:** Vegetables belonging to Allium family

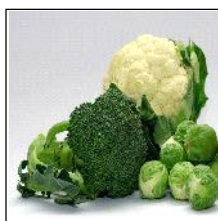
like garlic bulb, Chinese leek, Chinese chive, scallion and shallot bulb have been shown to possess strong antioxidant activity. Garlic is likely the most important herb widely quoted for its medicinal properties. The purported health benefits include chemoprotective, antibiotic and cholesterol lowering properties. The characteristics flavour and pungency are due to an abundance of water-soluble, sulphur-containing elements called allicin which is produced when the bulb is injured or crushed. Garlic components have been shown to inhibit tumorigenesis thus reducing the risk of human cancer. It has also been strongly advocated for prevention of cardiovascular diseases. Garlic powder or tablets have been found to improve immune response.



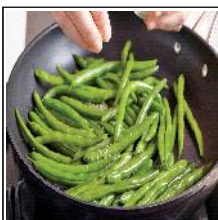
**Ginger:** Ginger is best source of gingerol. It is known to increase the production of substances that protect the stomach lining. Preventing the formation of ulcers; stimulates gastric activity, causing the stomach to empty more quickly; stimulates gall bladder, promoting healthy digestion and helps alleviate nausea caused by pregnancy and motion sickness.



**Broccoli and cruciferous vegetables:** Direct sulforaphane (glucosinolate), a naturally occurring compound found in Cruciferous vegetables and broccoli sprouts, may provide more health benefits than previously realized. Now, studies show that it may be even more versatile and effective than vitamins C and E in protecting cells from oxidative damage. It plays a key role in increasing the body's natural antioxidant defense systems and may function as a powerful indirect antioxidant with a longer lasting effect than other antioxidants such as vitamins C and E. Scientist at John Hopkins university found that lab animals fed with Cruciferous vegetables had a 90 per cent reduction in their cancer rate after being exposed to aflatoxin, a deadly cancer causing agent. Other sources are broccoli, cabbage and cauliflower, kale, kohlrabi, collard, radish, rutabaga and turnip.



**Beans:** Soybean is best source of genistein (an iso-flavonoid), phytosterols and saponins. It suppresses the growth of cancer cells



in the large in testine and enhances immunity against many cancers. Other compounds in soybean also reduce blood cholesterol level.

**Orange, red and dark green**

**vegetables:** Vegetables like pumpkin, carrots, cantaloupe, kale and yellow corn are a rich source of natural alpha carotene, whereas potatoes, carrots and pumpkin, spinach and leafy vegetables are rich in beta-carotene.



Alpha carotene reduces the risk of lung cancer and boosts the immune system. Beta-carotene functions as a powerful antioxidant protecting the protein, fat and DNA in cells from free radical damage.

**Chilli peppers** (*Capsicum*

*annuum*): Capsaicin, the phytochemical present in chilli, impedes carcinogens such as nitrates and cigarette smoke from attacking. Kale, spinach, beet, collard and mustard greens are a good source of lutein and zeaxanthin (carotenoid). These pigments work by forming a pigment in the eye that filters out damaging forms of light and functions as antioxidant, protecting against cell damage, thus, reduces the risk of macular degeneration (the most common cause of blindness in elderly). Spinach is regarded as the brain food needed to avoid memory loss.



Taching to cellular material, thus preventing formation of cancer cells. It may also kill the bacteria that can cause ulcers.

**Citrus fruits:** Oranges, lemons, limes

and grapefruits are the principal sources of vitamin C, folate and fibre. They are also high in a class of phytochemical called limonoids. This antioxidant has been found to be very effective against cancer.



**Berry fruits:** Berries especially

coloured like cranberry, strawberry, black berry, aronia, bilberry and whortle are rich sources of flavonoids and phenolics. According to a breakthrough research at Rutgers University, New Jersey, blue berries is the number one antioxidant fruit. It has been found to be beneficial in fighting off urinary tract infections by blocking or prohibiting the growth of bacteria. Concentrated extracts of anthocyanins also benefits visual

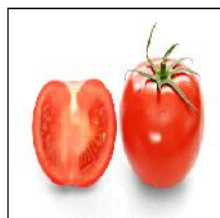


activity as well as provide protection against macular degeneration, glaucoma and cataracts.

**Grape and wine:** Flavonoids and other phenolics present in grape and grape products have been shown to possess anti-carcinogenic, anti-inflammatory, anti-thrombic and anti-oxidant effects. The ability of phenolic substances in prevention of atherosclerosis and risk reduction of cardio-vascular diseases has been aptly demonstrated by the benefits of red wine consumption often referred as French paradox. The paradox refers to epidemiological findings that in certain parts of France where wine consumption is high, coronary heart disease mortality is low despite relatively high cholesterol levels in population.



**Tomato:** Red is reassuring sign at least in vegetables. Lycopene the compound responsible for red colour of tomato protects the human body from the ravages of cancer and cardio-vascular diseases. Eating over 10 tomatoes/week has shown to reduce cancer by 35 per cent and is also effective in reducing cholesterol.



**Apples:** Apples according to scientists are a nutritional treasure chest. Apple skin helps ward off cancer through a unique mix of molecules called flavonoids and polyphenols. Studies show that apples checks proliferation of most liver cells and colon-cancer cells. The fruit supplies a range of nutrients such as iron, copper, vitamin C, malic acid and calcium. Eating an apple is a more efficient way of cleaning teeth than a tooth brush. It also plays a role in preventing heart disease. The fruit also prevents disease like rheumatism and arthritis.



**Beal:** Beal fruit is a source of riboflavin and ascorbic acid. The pulp of the fruit although a little acrid bitter is aromatic and acts as sweet cooling tonic. The pulp contains a large amount of mucilage and gum as a result of which it has the important curative properties as appetizer and is often prescribed for stomach problems.



**Jamun :** Jamun fruits known for their acrid and astringent taste is useful for curing diarrhoea and diabetes. It is

stomachic and diuretic apart from having cooling and digestive properties. Jamun seeds are high in phenolics and are prescribed in diabetes, diarrhoea, dysentery, ring worms and blood pressure.



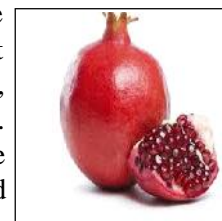
**Kokum:** Kokum has fine flavour and makes excellent beverages. It is known to reduce obesity and regulate blood cholesterol level to keep heart healthy. It has fine flavour and makes an excellent beverage.



**Aonla:** It is rich in polyphenol and ascorbic acid. It is valued as an antiscorbutic, diuretic, laxative and antibiotic. One or other part of the plant could be used in treating chronic dysentery, bronchitis, diabetes, jaundice dyspepsia and cough. The fruits are processed into “Chavanprash” and “Trifala” in Ayurvedic system of medicine.



**Pomegranate:** Every part of the pomegranate is used in the treatment of dysentery, diarrhoea, stomachache, dyspepsia, bronchitis and cardiac. These therapeutic properties are due to the presence of betulinic acid and urolic acid and different alkaloids-pseudopelletierine, pelletierine, isopelletierine and methyl pelletierine. The unripe fruits and flowers are useful in inducing vomiting and the rind of the fruits is given in diarrhoea and dysentery. It is also useful in sore throat and eyes, brain disease and chest troubles.



**Mahua:** Both flowers and fruits of mahua are eaten in various ways. Mahua flowers are regarded as cooling tonic and demulcent. They are used in cough and colds.



Tremendous interest in the antioxidant components in fruits and vegetables, and their possible health-promoting effects has stimulated world wide research to identify potential sources. In this context, there is a dire need to document the antioxidant potential of our indigenous wealth of fruits, vegetables and medicinal herbs in terms of their free radical scavenging to establish them as functional and health foods.