Review Article

Effect of Antioxidant Activity of Horticulture Crops for Human Health

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Abstract

At present time, people are struggling with various stresses in society and having various diseases like diabetes, cardiovascular disease, allergy, cancer, hypertension, decline of physically and mental capabilities along with social values. Fruits and vegetables are immense store of the active chemical compound and considered as the cheapest and most easily available sources of carbohydrates, protein, fibres, minerals, vitamins and secondary metabolites (phenolic, flavonoids, and antioxidant activity). So, people should be intake pigmented fruits and leafy vegetables, lower the risk of chronic diseases, cardiovascular disease, anaemia, cancer, diabetes and oxidative stress. "In recently", vegetables have been identify as safe and expression system for recombinant proteins including vaccines against many diseases like as malaria, rotavirus, HIV, hepatitis etc. so, nutraceutical in fruits and vegetables are beneficial for human health.

Keywords: Fruits, Vegetables, Phenolic, Flavonoids, Antioxidant activity, Diseases

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Introduction

The antioxidant activity of extracts from fruit and vegetable crops were evaluated for their phenolic, flavonoids and antioxidant activity. Amongst fruits the highest phenolic content was observed in pigmented fruits and vegetables such Plums, grape, Anola and apple were amongst the fruits with maximum total flavonoids content. Vegetable like kachnar and drumstick had exceptionally high phenolic followed by leafy vegetables. Highest antioxidant was observed in black carrots followed by kachnar flowers dumar, beetroot and drumstick flowers (Kumar, *et al*, 2015) All fruits and vegetables are beneficial for human health but pigmented fruits and leafy vegetables are very beneficial for pregnant women due to rich source of nutraceutical and folic acid. They are Prevent constipation and enhance gastrointestinal function (Wagesnteen, *et al.*, 2004). it is helpful in weight management through controlling hunger (Ell-martin, *et al.*, 2005), reduce the chances of metabolic diseases viz., diabetes mellitus and hypercholesterolemia (Azadbakht, *et al*.,2012), reduce the oxidative stress (Esfahani, *et al.*, 2011), and enhance the immunity of human system (Gibson, *et al.*,2012). consumption of green salad reduces the risk of chronic diseases like diabetes, cancer, central nervous system defects, neutral tube defects in infants and cardiovascular diseases (Adams, *et al.*, 2006), The most important group of antioxidants found in fruits and vegetables include ascorbic acid, α-tocopherol, β-carotene, glutathione, betacyannin, phenolics, anthocyanins, and flavonoids present in foods (Pennington and Fisher 2009). The chemistry of horticultural crops including edible and non-edible plant biomass is gaining importance for their metabolite capabilities to compete with conventional medicinal plants constituents for preventive health care (Khanuja & Shukla, 2011). Brassicas are having highly antioxidant activity so they are beneficial for human health.

Composition of fruits and vegetables

Phenolics

Phenolics are aromatic benzene ring compounds with one or more hydroxyl groups produced by plants mainly for protection against biotic and abiotic stress. Phenolic compounds, including stress-linked phytochemicals, have been related to favorable impacts, which are caused by the consumption of fruits and vegetables, particularly due to their antioxidant activity (Balasundram *et al.*, 2006). Plant polyphenols as dietary antioxidants in human health and disease might offer some protection against oxidative damage. There are many fruits and vegetables that contain phenolic compounds, especially, grapes, berries and tomatoes. (Pappas and Schaich, 2009).Cranberry juice was used for healing urinary tract infections and recent studies verified the antibacterial effects of cranberries.

Flavonoids

Flavonoids are a diverse group of phytonutrients found in almost all fruits and vegetables. They are the largest group of phytonutrients, with more than 6,000 types. Some of the best-known flavonoids are quercetin and kaempferol. It is anti-cancer potential, research on flavonoids has been somewhat mixed. Due to their well-documented antioxidant and anti-inflammatory properties, flavonoids would be expected to lower risk of certain cancers since chronic oxidative stress and chronic unwanted inflammation can place cells at greater risk of becoming cancerous (whfoodd.org). Flavonoids are mostly found in onion, garlic, tomato, brijal etc.

Table 1 Effect of active compounds of fruits for the human health

Local name	Scientific name	Family	Active principle	Beneficial effect of health	Reference
Mango	*Mangifera indica*	*Anacardiaceae*	Galic acid, Beta-carotene, Anthocyanin	The beta-carotene present in pulp to helps in enhancing immune system of the body.	Waauthoz, et al., (2007)
Pomegranate	*Punica granatum*	*Punicaceae*	Ursolic acid, Carotene, Anthocyanin	To prevent the breast cancer, reduce the blood pressure, preventing constipation during pregnancy in women	Jurenka, et al., (2008)
Plum	*Prunus domestica*	*Rosaceae*	Anthocyanin, Malic acid	It is Useful for prevent of atherosclerosis and preserve bone density	Tanaka, et al., (2011)
Guava	*Psidium guajava*	*Myrtaceae*	Eugenol, Ascorbic acid, Anthocyanin	Anti-bacterial activity against diarrhoea causing organism like salmonella & bacillus.	Guttierez, et al., (2008), Kamath, et al., (2008)
Pineapple	*Annanas comosus*	*Bromeliaceae*	Bromelin	Making of uterine tonic, helps in faster wound healing	Khan, et al., (2011)
Indian gooseberry	*Phyllanthus embelica*	*Euphorbiaceae*	Emblic acid, Phyllanthin, Ascorbic acid	It is used for treatment of scurvy diseases, antivirus,	Deb mandal & Manda (2011)
Papaya	*Carica papya*	*Caricaceae*	Papain, Carpaine & Carposide, Lycopene, beta- Carotenoid	Fibrinolysis helps in dissolving the blood clots. Contain high manganese which is good for preventing osteoporosis and bone fracture	Anibijuwon & udeze (2009), singh & ali (2011)
Bael	*Aegle marmelos*	*Rutaceae*	Mucilage, Pectin, Riboflavin	Anti-ulcer, stomachic, prevention of cardiovascular diseases	Sharma, et al., (2011)
Banana	*Musa paradisica*	*Scitaminaceae*	Rich in minerals like Ca, P, Fe, S, Mg	Good for dyspepsia & ulcer etc.	Imam & Akter (2011)
Lime	*Citrus limomum*	*Rutaceae*	Geraniol, Linalool, Citral	Juice good for asthma, headaches, blood purifier	Bertuzzi, et al., (2013)

Antioxidant activity

An antioxidant is a molecule that inhibits the oxidation of other molecules. Oxidation is a chemical reaction that can produce free radicals, leading to chain reactions that may damage cells. Several reports have shown that adequate intake of fruits and vegetables form an important part of a healthy diet and low fruit and vegetable intake constitute a risk factor for chronic diseases such as cancer, coronary heart disease (CHD), stroke and cataract formation (Van Duyn & Pivonka, 2000). It is highly antioxidant activity found in pigmented of fruits and vegetables which are beneficial for prevention of different diseases such cardiovascular, cancer and reduces the formation of free radicle in cell of human.

Table 2 Effect of active compounds of vegetables for the human health

Onion	*Allium cepa*	*Amaryllidaceae*	Sulphur compounds, Flavonoids, Phenolic.	beneficial effects against cardiovascular and neurological diseases	Liguori, et al., (2017)
Garlic	*Allium sativum*	*Amaryllidaceae*	Allicin, thiosulfinate	To enhance immunity and help lower the risk of cancer, heart disease and dementia	Rahman, et al., (2012),
Tomato	*Lycopersicum esculentum*	*Solanaceae*	Lycopene, Beta-carotene	It is decreased risk of chronic diseases, such as cancer and cardiovascular disease.	Chekki, et al., (2014)
Brinjal	*Solanum melongena*	*Solanaceae*	Anthocyanin, Phenolic, Chlorophyll	To control the diabetes and cancer diseases	Shi, et al., (2000),
Capsicum	*Capsicum frutescence*	*Solanaceae*	Carotenoids, Capsanthin, Quarcetin	It can terminate a free radical chain reaction and prevention of cardiovascular disease, cancer and diabetes	Agarwal, et al.,(2000)
Broccoli	*Brassica oleracea var. italica*	*Brassicaceae*	Isothiocyanates, Indole-3-carbinol.	Prevent the cancer, & cardiovascular diseases	Baez, et al., (2014)
Cabbage	*Brassica oleracea var. capitata*	*Brassicaceae*	Isothiocyanates, Indole-3-carbinol.	Amounts of anthocyanin to decrease the risk of cardiovascular diseases, brain disorders and cancer.	Rahim, et al, (2012)
Cauliflower	*Brassica oleracea var. botrytis*	*Brassicaceae*	Sulforaphane, Isothiocyanates	It contains sulforaphane which protect against cancer, diabetes.	Lin, L. Z. & Harnly, J.M., (2009)
Carrot	*Daucus carota*	*Apiaceae*	Carotenoids & Anthocyanin	To maintenance of health, protection from coronary heart disease, cataracts	Draghici, G.A., et. Al., (2013)
Radish	*Raphanus sativus*	*Brassicaceae*	Isothiocyanates, anthocyanins	To protect from several chronic degenerative disorders and cancer	Suganya, et al., (2016)
Beet root	*Beta vulgaris*	*Amaranthaceae*	Betalain, Betacyanins (betanin and isobetanin)	Blood purifier, anticancer, anti-cardiovascular	Sharma, & Thakur, (2012)
Water melon	*Citrullu lanatus*		Carotenoids, Flavonoids, Lycopene.	To reduce the cholesterol level in human.	Ishida, et al., (2014)
Cucumber	*Cucumis sativus*	*Cucurbitaceae*	Minirals, water-95%	To benefits for skin, soothing properties for digestion, and other therapeutic uses.	Clifford, et al., (2015)
Bitter gourd	*Momordica Chorantia*	*Cucurbitaceae*	Momordicin, charantin	To beneficial effects on glucose tolerance and lipid profile in streptozotocin-induced type-II diabetic rat.	Brutton et al., (2009)
Summer squash	*Cucurbita pepo*	*Cucurbitaceae*	Rich sources of carotenoids	To prevention of blindness, Anticancer, Anticardiovascular	Murad, et al., (2016)

Spinach	*Spinacia oleracea*	*Chenopodiaceae*	Folic acid, rich source of iron, vitamin k	Control the free radicle, responsible for the development of a foetus and restricting birth defects like spina bifida.	Parmar, et al., (2011)
Fenugreek	*Trigonella foenum-graecum*	*Fabaceae*	Folic acid		Yadav, et al., (2016)
Mustard	*Brassica juncea*	*Brassicaceae*	Sinigrin, phenolic, flavonoids, folic acid lutein, vitamin K,	To lower cholesterol and diminish the incidence of coronary. folic acid are responsible for the development of a foetus and restricting birth defects like spina bifida.	Hedges, et al., (2007)
Bathua/ Pigweed	*Chenopodium album*	*Chenopodiaceae*	Rich source of Fe, Vitamin A,	To beneficial for piles, clearing worms, blood purifier in hepatic disorders,	
Amaranthus	*Amaranthus tricolor*	*Amaranthaceae*	Anthocyanin, Folic acid, Vitamin A	To prevent the formation of free radicle	Romero, (2002)

Anthocyanin

Anthocyanins are one of the largest and most important groups of water soluble pigments in most species in the plant kingdom. They are accumulated in cell vacuoles and are largely responsible for diverse pigmentation from orange to red, purple and blue in flowers, fruits, such as: blackberry, red and black raspberries, blueberries, bilberries, cherries, currants, blood orange, elderberries, grapes, and vegetables such as: red onion, radish, red cabbage, red lettuce, eggplant, red-skinned potato and purple sweet potato (Horbowicz, M., *et al.*, 2008). It is responsible for control of the formation of free radicle in cell.

Ascorbic acid

Ascorbic acid also called as vitamin C, it is found particularly in citrus fruits and green vegetables. It is essential in maintaining healthy connective tissue, and is also thought to act as an antioxidant. Severe deficiency causes scurvy diseases a lack of vitamin C in your body happens because of a lack of sufficient amounts of vitamin C in your diet. Ascorbic acid is one of the important water soluble vitamins. It is essential for collagen, carnitine and neurotransmitters biosynthesis. Most plants and animals synthesize ascorbic acid for their own requirement. However, apes and humans cannot synthesize ascorbic acid due to lack of an enzyme gulonolactone oxidase (Naidu, 2003). The current US recommended daily allowance (RDA) for ascorbic acid ranges between 100–120 mg/per day for adults.

Carotenoids

Beta carotene is a precursor of vitamin A that is produced by many different species of plants. It belongs to a group of chemicals known as carotenes, which are themselves part of a larger chemical group called carotenoids. Carotenoids are plant pigments responsible for bright red, yellow and orange hues in many fruits and vegetables. Carotenoids also have anti-inflammatory and immune system benefits and are sometimes associated with cardiovascular disease prevention. Dietary carotenoids are thought to provide health benefits in decreasing the risk of disease, particularly certain cancers and eye disease (Johnson, 2002).The carotenoids that have been most studied in this regard are beta-carotene, lycopene, lutein, and zeaxanthin. The German Nutrition Society (DGE) recommends a 40% increase in vitamin A intake for pregnant women and a 90% increase for breastfeeding women.

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