

ROLE OF JUICES CONTAINING ANTIOXIDANTS IN THERAPEUTICS OF ACUTE AND CHRONIC ILLNESS

#Kamal Kishore, Anushika Mishra, Sobhna Singh

Department of Pharmacy, M.J.P. Rohilkhand University, Bareilly-243006,
(Uttar Pradesh), India.

#for correspondence

E-mail: kamalbareilly@yahoo.co.in

Summary

The herbs, vegetable and fruits juices can be made easily at home or commercially available in the market. They contain powerful antioxidants that fight with free radicals, which are said to be responsible for as much as 90% of all human diseases like Rheumatoid arthritis, Myocardial infarction, Haemochromatosis, Malignancy, Amyloidosis, Parkinsonism, Alzheimer's disease, Demyelinating diseases, Schizophrenia, Stroke, Atherosclerosis, Diabetes mellitus, Cataract, Retinopathy, Sickle cell anemia, Emphysema, Alcoholic cardiomegaly, Phenacetin and paracetamol poisoning, Lead poisoning, Postischaemic conditions, Vitamin deficiency, Aluminum toxicity, Oxygen toxicity, Renal toxicity induced by aminoglycosides, Heavy metals and NSAIDs ischemic acute renal failure, Tobacco smoke toxicity, Ethanol intoxication, Haemolysis due to antimalarials, Sunburn & Radiation injury and aging. This article may improve understanding about the juices of the users and readers.

Key words: Juices, Antioxidants, Polyphenols, Vitamins

Grape:



Grape (*Citrus paradisi*) is a subtropical citrus tree known for its bitter fruit. Anthocyanins tend to be the main polyphenolics in purple grapes whereas flavan-3-ols or

catechins are the more abundant phenolic compound in white varieties. Total phenolic dietary antioxidant strength, is higher in purple varieties due to the presence of anthocyanin in purple grape skin compared to absence of anthocyanins in white grape skin. The seeds constituents of grape like tocopherols, phytosterols, anthocyanins, tannins, polyphenols and polyunsaturated fatty acids such as linoleic acid, oleic acid and alpha-linolenic acid are shows inhibitory activities against several diseases, including cancer, heart failure and other disorders of oxidative stress¹. The grape seed oil is used in cosmeceuticals and skincare products. Grapes contain polyphenolic compounds including flavonoids which can reduce platelet aggregation and have been associated with lower rate of cardiovascular disease in compression to citrus juice²⁻⁴. Grapes polyphenol could reduce atherosclerosis by a number of mechanism such as inhibition of oxidation of low density lipoproteins and other favorable affection cellular redox state, improvement of endothelial function, lowering blood pressure, inhibition of platelet aggregation⁵, reducing inflammation, and activating novel protein that prevent cell senescence. It reduces atherosclerotic plaque formation⁶; inhibit breast cancer cell proliferation and mammary cell tumorigenesis⁷. It increases bioavailability of the drug like felodipine, amiodarone by inhibiting CYP3A4⁸. Platelet releases the soluble CD40 ligand that may contribute to the development of atherosclerosis and vascular inflammation. Grapes juice inhibits the superoxide production and platelet aggregation⁵, and ultimately helps to reduce the risks of atherosclerosis.

Pomegranate:



Pomegranate (*Punica granatum*) is a fruit-bearing deciduous shrub or small tree growing between five to eight meters tall. Pomegranate juice is made from the pomegranate fruits that contains vitamin A, E C and folic acid in handsome amount and has excellent antioxidant properties. The endothelium dysfunction has been closely associated with atherosclerotic disease and compromises⁹. The availability of nitric oxide (NO) in the penile tissues necessary to cause muscle relaxation and the resultant tumescence and rigidity. Increasing the availability of endothelium derived NO is believed in increase ultimately erectile dysfunctions (ED). PDE₅ inhibitor, first line therapy for ED, prevent the brake down of cGMP while appearing to facilitate local NO release in the tissue with resultant erectile response. Pomegranate has been demonstrated

to contain the highest potency of antioxidants when compare to other beverage enhancing the action of NO by vascular endothelium cell¹⁰. Phytochemicals of pomegranate may inhibit cancer cell proliferation and apoptosis through the modulation of cellular transcription factor and signaling protein. The polyphenolic phytochemicals of pomegranate also play an important role in the modulation of inflammatory cell signaling in colon cancer cells¹¹. Pomegranate fruit extract (PEF) possesses strong antioxidant and anti-inflammatory properties. It also possess remarked antitumor promoting effect in mouse skin and human prostate cancer cells, evaluated the antiproliferative and proapoptotic properties of PFE. PFE treatment of highly aggressive human prostate cancer PC3 cells resultant in a dose dependant inhibition of cell growth/cell viability and induction of apoptosis. Pomegranate juice may play a vital role in the treatment of prostate cancer¹².

Cranberry:



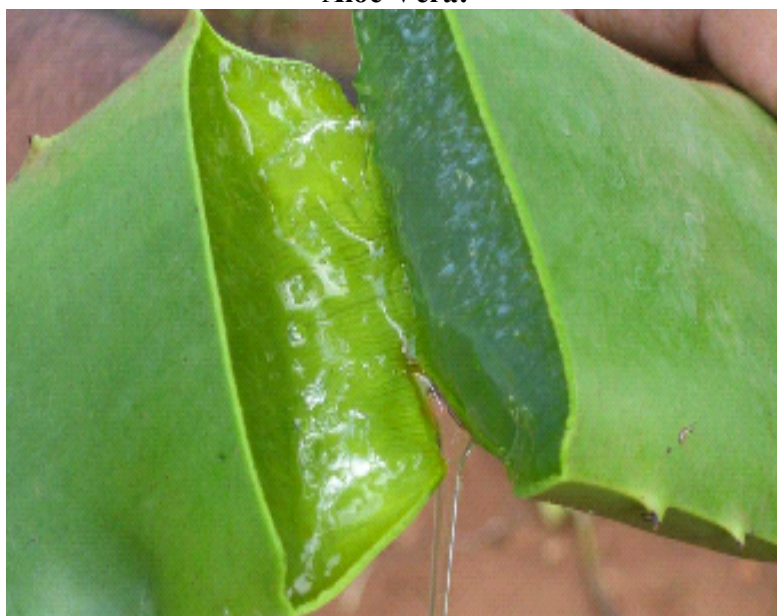
Cranberries are a group of evergreen dwarf shrubs or trailing vines in the genus *Vaccinium* subgenus *Oxycoccus*, or in some distinct genus *Oxycoccus*. Cranberries have moderate levels of vitamin C, dietary fiber and the essential dietary mineral, manganese, as well as a balanced profile of other essential micronutrients. Cranberries are a source of polyphenol antioxidants. Cranberry juice contains a chemical component, a high molecular weight non-dializable material that is able to inhibit and even reverse the formation of plaque by *Streptococcus mutans* pathogens that cause tooth decay. Cranberry juice components also show efficacy against formation of kidney stones. The oligomeric procyanidins is the specific compound of cranberries which boost blood vessel and prevent blood vessel constriction and helps in prevention of heart diseases¹³. Cranberry juice increases antioxidant which affecting cholesterol homeostasis¹⁴. It prevents bacterial adhesion to uroepithelial cells and prevents urinary tract infections¹⁵. It is also reported that cranberry beverage reduce the frequency of bacteriuria with pyuria in older women¹⁶.

Tomato:



Tomato is a savory, typically red, edible fruit, as well as the plant (*Solanum lycopersicum*) which bears it. Tomato juice contains a factor that inhibits platelets in blood from clumping together and forming blood clots. Tomato juice also contains the antioxidant lycopene. The lycopene consumption may protect against prostate cancer, breast cancer, atherosclerosis, and coronary artery disease. Drinking tomato juice regularly can help type-2 diabetics stave off heart trouble¹⁷, a common problem associated with type-2 diabetes. The epidemiological studies have revealed an inverse relation between tomato intake or serum lycopene level and the risk for several types of human cancer. The effect of 100% pure tomato juice drinking on the antimutagenicity of saliva¹⁸ and reported to suppress carcinogenesis.

Aloe-Vera:



Aloe vera, also known as the true or medicinal aloe. The *aloe vera* extracts may be useful in the treatment of arthritis, asthma, candida, chronic fatigue syndrome, digestive and bowel disorder, lupus erythematoses, skin problem like eczema, psoriasis, acne, burns, coldsores, frostbite, sport injuries, external and internal ulcers, wound and burn healing, minor skin infections, sebaceous cyst, diabetes, and elevated blood lipids in humans¹⁹. These positive effects are thought to be due to the presence of compounds such as polysaccharides, mannans, anthraquinones, and lectins.

Gojiberry:



Gojiberry or wolfberry is the common name for the fruit of two very closely related species: *Lycium barbarum* and *L. Chinese* of solanaceae family. Wolfberry species are deciduous woody perennial plants, growing 1–3 m high. *L. Chinese* is grown in the south of China and tends to be somewhat shorter, while *L. barbarum* is grown in the north, primarily in the Ningxia Hui autonomous region, and tends to be somewhat taller. Gojiberry has been recognized in traditional Chinese medicine for various therapeutic properties based on its antioxidant and immune modulating effect. Orally consumed gojiberry juice alters the photodamage induced in the skin of mice by acute solar simulated UV irradiation²⁰. Gojiberry juice blend with grape and pomegranate are called Gochi Juice. Gochi juice increases endurance, energy and reducing fatigue. It has effect on the brain and neuronal function, produce psychological and neurological effect; and possess antiaging properties. It facilitates recovery of red blood cells. It may provide benefits to eye health and vision. It modulates metabolism, improving physical performance and gastrointestinal function; contains polysaccharides, improving regularity. It also possess antidiabetic and in-vivo antioxidant properties, reducing blood glucose levels and DNA damage, elevating blood levels of superoxide dismutase, recommended for the treatment of diabetes and metabolic disorders²¹.

Blueberry:



Blueberries are flowering plants of the genus *Vaccinium* blueberries have a diverse range of micronutrients with notably high levels of the essential dietary mineral, vitamin-c, vitamin-k and dietary fibers. Blueberries contain anthocynins, antioxidant pigments

and various phytochemicals possibly having a role in reducing risks of some diseases including inflammation and certain cancers. Blueberries contain pterostilbene, anthocyanins, proanthocyanins, resveratrol, flavonols and tannins, which inhibit mechanisms of cancer cell development and inflammation in-vitro. Blueberry juice after biotransformation by *Serratia vaccinic* bacterium may response a novel therapeutic agent that decreases hyperglycemia in diabetic mice and can protect young prediabetic mice from developing obesity and diabetes²². It is also reported that the blue berry juice improve memory²³.

Cherry:



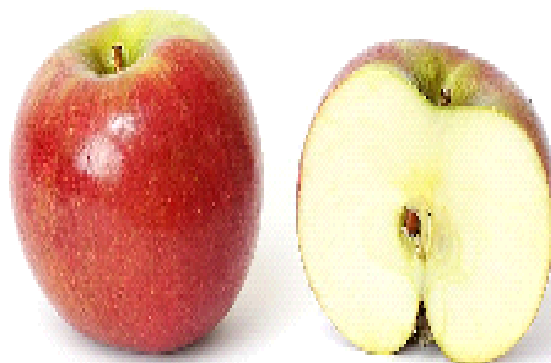
Cherry is the fruit of many plants of the genus *Prunus*. It is a fleshy stone fruit. The cherry fruits of commerce are usually obtained from a limited number of species, including especially cultivars of the wild cherry, *Prunus avium*. Cherries contain anthocyanins, the red pigment in berries. Cherry anthocyanins have been shown to reduce pain and inflammation in rats. Anthocyanins are also potent antioxidants under active research for a variety of potential health benefits. Tart cherries consists of melatonin in higher amount which could help in reducing the severity of insomnia and time spent awake after going to sleep and only is melatonin linked to sleep, but can have powerful antioxidant, helps to reduce age-related inflammation and fighting free radicals in the body^{24, 25}.

Orange:



The sweet orange (*Citrus sinensis* osbeck) and its fruit juice is a popular beverage made from oranges. It is made by extraction from the fresh fruit, by desiccation and subsequent reconstitution of dried juice, or by concentration of the juice and the subsequent addition of water to the concentrate. Orange juice is a good source of vitamin-C, potassium, thiamine, phosphorus-G, folic acid or [vitamin B₉](#), and vitamin B₆. The vitamin-C in turn aids the body's absorption of iron. Citrus juices also contain flavonoids that are believed to have beneficial health effects²⁶. Oranges are an excellent source of vitamin-C. Citrus Juices especially of orange and grapes juice are rich source of vitamin-C. Mixtures of various juices improve the blood profile, reduce oxidative stress and prevent atherogenic modification of LDL, cholesterol and platelet aggregation^{27, 28}. Orange Juice by acting as antioxidant and at the molecular level vitamin-E and C can participate in preservation of cell membrane composition and function, protect molecules such as cholesterol and DNA from oxidative damage, and consequently improve human health and decrease chronic diseases²⁹. Vitamin-C improves lysosomal function, act as a cofactor for dopamine-hydroxylase³⁰ mediates glutamine uptake and contributes to preserve a healthy vasculative through the regulation of collagen synthesis, prostacyclin production and maintenance of nitric oxide levels. Orange juice enhances the immune response due to the presence of vitamin-E in human³¹.

Apple:



Apples contain relatively low amounts of vitamin-C, but are a rich source of other antioxidant compounds³². The fiber content, while less than in most other fruits helps to regulate bowel movements and may thus reduce the risk of colon cancer³³. The fractionation of polyphenol-enriched apple juice extracts to identify constituents with cancer chemopreventive potential. They may also help with heart disease, weight loss, and controlling cholesterol. The fiber contained in apples reduces cholesterol by preventing reabsorption, and (like most fruits and vegetables) they are bulky for their caloric content^{32, 34}. Apple juice is manufactured by the maceration and pressing of apples. Apple juice has a significant concentration of polyphenols of low molecular weight such as chlorogenic acid, flavan-3-ols, and flavonols and procyanidins that may protect from diseases associated with aging due to the antioxidant effects which help to reduce the likeliness of developing cancer and Alzheimer's disease³⁵. Investigation suggests that apple juice

increases acetylcholine in the brain, resulting in increased memory. Fresh apple juice carries a significant amount of vitamins A and C³².

Conclusion

Juices of herbs, fruits and vegetables contain powerful antioxidants which fight with free radicals. The pathophysiological research shows that the free radicals are involved in numerous diseases and disorders such as Atherosclerosis, Alzheimer's, Parkinsonism, stroke, Huntington's chorea, Amyotrophic lateral sclerosis and certain types of cancers. It is clear from the literature that the natural juices of herbs, fruits and vegetables play a vital role in good health and the treatment of acute and chronic complicated diseases like Rheumatoid arthritis, Myocardial infarction, Haemochromatosis, Malignancy, Amyloidosis, Parkinsonism, Alzheimer's disease, Demyelinating diseases, Schizophrenia, Stroke, Atherosclerosis, Diabetes mellitus, Cataract, Retinopathy, Sickle cell anemia, Emphysema, Alcoholic cardiomegaly, Phenacetin and paracetamol poisoning, Postischaemic conditions, Vitamin deficiency, Aluminum toxicity, Oxygen toxicity, Lead poisoning, Renal toxicity induced by aminoglycosides, Heavy metals and NSAIDs ischemic acute renal failure, Tobacco smoke toxicity, Haemolysis due to antimalarial drugs, Ethanol intoxication, Sunburn & Radiation injury and aging.

References

1. Cerda JJ, Narmann SJ, Sullivan MP. Inhibition of atherosclerosis by dietary pectin in mice with sustained hypercholesterolemia. *Circulation* 1994; 89:1247-1253.
2. Ross SA, Ziska DS, Zhou K. Variance of common flavonoids by brand of grapefruit juice. *Fitoterapia* 2000; 71:154-161.
3. Mustali M, Donadwala, Joseph AV. Grape and cardiovascular disease. *J. Nutr.* 2009; 139:1788S-1793S.
4. Keevil JG, Osman HE, Reed JD, Folts JD. Grape juice, but not orange juice or grape fruit juice, inhibits human platelet aggregation. *Journal of Nutritional* 2009; 130(9):1788S-1793S.
5. Jane EF. Concord grape juice increased HDL, lowered inflammatory marker linked to heart disease. *J. Arterioscler. Thromb. Vasc. Biol.* 2004; 24: 179-180.
6. Kiani J, Imam ZS. Medicinal importance of grape fluid juice and its interaction with various drugs. *Nutrition Journal* 2007; 6:33-41.
8. Lundahl J, Regardh CG, Edgar B, Johnsson G. Effect of grape fruit juice ingestion-pharmacokinetics and hemodynamics of intravenously and orally administered felodipine in healthy man. *European Journal of Clinical Pharmacol* 1997; 25:139-145.
9. Aviram M, Dornfeld L, Rosenblat M, Volkova N, Kaplan M, Coleman R, Hayak T, Presser D, Fuhrman B. Pomegranate juice consumption reduce oxidative stress, atherogenic modification to LDL, and Platelet aggregation: Studies in humans and in atherosclerotic apolipoprotein-E deficient mice. *American Journal of Clinical. Nutritional* 2000; 71:1062-1076.
10. Forest PC, Nathan PH, Liker RH. Efficacy and safety of pomegranate juice on improvement of erectile dysfunction in male patients with mild to moderate erectile

- dysfunction: a randomized, placebo controlled, double-blind crossover study. *International Journal of Importance Research* 2007; 19:564-567.
11. Adams LS, Seeram NP, Aggarwal BB, Takada Y, Sond D, Heber D. Pomegranate juice, total pomegranate Ellagitannins, and Punicalagin suppress inflammatory cell signaling in colon cancer cells. *Journal Agriculture Food Chemistry* 2006; 54(3):980-985.
 12. Malik A, Afag F, Sarfaraz S, Syed ND, Mukhtar H. Pomegranate fruit juice for chemo-preventive and chemotherapy of prostate cancer. *Proceeding of National Academy of Science, USA*, 2005; 102:14813-14818.
 13. Marcus. Cranberry juice healthy heart and constipation. *Journal of Agriculture and Food Chemistry* 2010.
 14. Farzad D, Bhimanagouda SP, Arnulfo V, Erica L, Kristi G, Ryan R, Claudia G, Cheri G, Karanthi M. Cranberry juice increases antioxidant status without affecting cholesterol Homeostasis in Orchidectomized rats. *Journal of Medicinal Food* 2007; 10(1):49-53.
 15. Tao A, Pinzon-Arango PA, Camesano TA. Cranberry metabolites in urine inhibit bacterial adhesion. *Journal of Antimicrobial Chemotherapy* 2009; 50:219-224.
 16. Avorn J, Monane M, Gurwitz JH, Glynn RJ, Choodnovskiy I, Lipsitz LA. Reduction of bacteriuria and pyuria after ingestion of Cranberry juice. *JAMA* 1994; 271(10): 751-754.
 17. Lazarus S, Bowen K, Garg ML, 'Tomato juice and platelet aggregation in Type 2 diabetes', *JAMA*: 2004: 292: 805-806.
 18. Japan S. Beneficial effect of Tomato juice drinking on antimutagenicity of Saliva. *Journal of Environmental Health and Preventive Medicine* 2008; 7(6):289-291.
 19. Vogler KB. Aloevera: Asystematic review of its clinical effectiveness. *British Journal of General Practice* 1999; 49:823-828.
 20. Vivienne ER, Munif A, Sondur JA, Domanski D, Painter N. Mice drinking goji berry juice (*Lycium barbarum*) is protected from UV radiation-induced skin damage via antioxidant pathways. *Photochem. Photobiol. Sci* 2010; 9:601-607.
 21. Amagase H, Nance DM. A randomized, double-blind, placebo-controlled, clinical study of general effect of a standardized lycium barbarum (Goji) juice, Gochi. *Journal of Alternative and Complementary Medicine* 2008; 14(4):403-412.
 22. Vuong T, Benhaddou-Andaloussi A, Braul A, Harbilas H, Martineau L, Vallerand D, Ramassamy C, Matar HP. Antiobesity and antidiabetic effects of biotransformed blueberry juice in KKAY mice. *Intr J Obes* 2009; 33:1166-1173.
 23. Davis J. Blue berry juice may improve memory. *Journal of Agricultural and Food Chemistry* 2010.
 24. Hossain JL, Shapiro CM. The prevalence, cost implications and management of sleep disorders: on overview. *Sleep and Breathing* 2002; 6:85-102.
 25. Pigeon WR, Carr M, Gorman C, Perlis ML. Effect of tart cherry juice beverage on the sleep of older adults with insomnia: A pilot study. *Journal of Medicinal Food* 2010; 13:579-583.
 26. Manthey JA, Grohmann K, Guthrie N. Biological properties of citrus flavonoids pertaining to cancer and inflammation. *Curr Med Chem* 2001, 8:135-153.
 27. Simon JA. Vitamin-C and Cardio Vascular Disease: a review. *Journal of American Coll. Nutrition* 1992; 11: 107-125.

28. Ness AR, Khaw KT, Bingham S, Day NE. Vitamin-C Status and serum lipids. *European Journal of Clinical Nutrition* 1996; 50: 724-729.
29. Martin A, Cherubini A, Andres-Lacueva C, Paniagua M, Joseph JA. Effect of fruit and vegetable on level of vitamin E and C in the brain and their association with cognitive performance. *Journal Nutritional Health Aging* 2002; 6:392-404.
30. Menniti FS, Knoth J, Diliberto EJ. Role of ascorbic acid in dopamine beta-hydroxylation. The endogenous enzyme cofactor and putative electron donor for cofactor regeneration. *Journal of Biological Chemistry* 1996; 261:1690-1698.
31. Beharka A, Redican S, Leka L, Meydani SN. Vitamin-E status and immune function. *Methods Enzyme Molecular* 1997; 282: 247-263.
32. Boyer J, Liu RH, Rui Hai Liu. Apple phytochemicals and their health benefits. *Nutrition Journal* 2004; 3: 5-19.
33. Zessner H, Pan L, Will F, Klimo K, Knauff J, Niewöhner R, Hümmer W, Owen R, Richling E, Frank N, Schreier P, Becker H, Gerhauser C. *Molecular Nutrition & Food Research, Supplement. Natural Products and Dietary Prevention of Cancer* 2008; 52(1): S28-S44.
34. Sharma R. *Improve your health with Apple, Guava, Mango. Diamond Pocket Books (P) Ltd.* 2005, p. 22. ISBN 8128809245.
35. WASSC. Apples keep your family healthy. Washington state apple advertising commission. retrieved 2008; 22 January.