

Tea as Nutraceutical

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ABSTRACT

A strong link exists between health and food or drinks we consume. Many ailments like cancer, liver disorders, and diabetes etc. can be prevented and better health can be maintained by taking the right food or/and drinks. Such disease preventive and health protective food and drinks are called nutraceuticals. Tea contains powerful antioxidants like polyphenols and catechins and, therefore, has disease preventive, health protective and invigorating properties. Some scientific work carried out on the therapeutic and nutraceutical properties of tea are described in the present communication.

Key Words : green tea, black tea, red tea, oolong tea, nutraceutical, cosmeceutical anti oxidants, catechins, polyphenols.

A strong link exists between human health and the quality of food & drink consumed and air breathed by the man. It has been reported that many common health problems, such as heart diseases, liver disorders, diabetes, cancer and allergies etc. are linked to the quality of food eaten, water/drinks consumed or the air inhaled and to the sedentary life style of the individuals. Generally food and drink related ailments are called life style diseases. Health problems in the modern world are further complicated by indiscriminate use of the modern medicines, particularly the chemical drugs including the antibiotics, steroids, alkaloids, glycosides etc., most of which have harmful side effects. Realization of the above harmful side effects led to the development of alternate mode of healthcare since the last one or two decades. It is now well known that many diseases can be prevented if one takes a nutritiously balanced diet that suits best to the person in a given climate, drinks safe water and breathes pure air. Healthcare by diet regulation or by fortification of normal diet or drinks or for getting specific health benefits, are becoming popular in the world over.

This disease preventive and health promotive practice through the nutritional approach is known as nutraceutical or functional food approach to health care. It is now predicted that very soon in this century there will be more dieticians than physicians with the premise that a well-designed dietary regime can provide better health and prevent many diseases. Dieticians will be able to prescribe specific diet to individuals based on their constitutional nature i.e. the genetic constitution of the individual. With the fast advancements that we are witnessing in molecular biology and genetic engineering more particularly in genomics and proteomics such personalized health care is going to be a reality very soon. Indeed this is essentially the underlying principle in Indian classical systems of medicine like Ayurveda and Sidha wherein it advocated for determining the constitutional nature of the individual (Prakrithi) before prescribing food and medicine for human beings for the best maintenance of health or prevent many ailments or treating diseases. The ancient Greek physicians declared "food is thy medicine". Ancient Ayurvedic masters like Charak said "you are the product of food that you eat" and therefore they advocated the right choice of food in right quality and quantity & in right proportion, that suit the age groups, season and region (etc.) for maintaining a healthy, productive and satisfying life. Indeed the world is witnessing a paradigm shift in our approach to health and medicine. We

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are moving from a crisis intervention based healthcare to disease prevention to health promotion model in which the food and drinks are given special attention. Foods or drinks with special components that can equip the body with better health, provide resistance to diseases and improve efficiency, are called nutraceuticals or functional foods. Many traditional food and non-alcoholic beverages are now found to have disease preventive and health promotive properties. Tea is one of the most important disease preventive and health protective non-alcoholic beverage, and therefore well qualified to be called as a nutraceutical drink.

History of Tea Drinking:

Tea drinking has a very old but fascinating history, dating back to 2007 BC. According to a legend, Chinese emperor Shen Nong had accidentally discovered the stimulant property of tea 4000 years ago. One summer season while visiting a distant region of his kingdom, he and his court stopped for rest. In accordance with his ruling, the drinking water needed to be boiled as a precaution for hygiene, the servants began to boil water for the court to drink. Some leaves from a nearby bush fell into the boiling water, and it became a brown liquid infusion. The Emperor was fascinated by the drink. He found it very refreshing. According to the Chinese legend, tea drinking was thus begun with this ancient Emperor.

Tea drinking soon spread throughout the Chinese culture. The Buddhist monks of China made tea drinking very popular during the 9th and 10th centuries. Tea drinking spread to Japan around 10th century A.D. through the Buddhist monks. Tea received imperial patronage in Japan and it was elevated to an art form resulting in the creation of the famous Japanese Tea Ceremony.

Tea was introduced to Europe first by the Portuguese in 16th century and they developed a trade route by which they shipped their tea to Lisbon. Then the Dutch traders transported it to France, Holland and to some of the Baltic countries. Tea was an expensive item costing over \$ 100 per pound in those days. Only the wealthy people could afford it. Tea first reached

England as a gift of 1lb of tea leaves from a trader to Queen Elizabeth I in 1580s. According to the legend when Queen Elizabeth received the tea as a gift, the royal family ate it with butter. Next time when the Queen received the tea gift, Her Majesty the Queen exclaimed and enquired from the trader about the health benefits of tea as the royal family could not feel anything special after consuming the tea. On an enquiry as to how Her Majesty and the Royal family consumed tea, the queen replied saying that they ate it with butter. To this the trader explained that the tea is to be taken as an infusion in boiled water. On doing so, the Royal family enjoyed the tea and very soon it became a very popular and fashionable drink among the royals and aristocrats in England. It is said that the custom of 'At Home Parties' in Europe was started with tea drinking. Wealthy aristocrats began to organize tea drinking parties in their house and it was called as an 'At Home' party.

'At Home' parties soon become a popular status symbol among Aristocrats and the wealthy people of England in 18th and 19th century. On evenings the aristocrats and wealthy people used to meet at selected houses and drink tea in a ceremonial way and discuss contemporary issues of politics, arts and other matters of general interest. Tea also very soon became very popular among the whole population of Europe and tea became one of the most important commodity of trade in whole Europe. It is now one of the most favourite non-alcoholic drink of Europeans, Austrialians, Indians and people of many other countries.

Types of Tea:

Three types of tea are manufactured and consumed in the world. These are green, black and the red or Oolong tea. The difference between these three 'teas' are due to the different degree of fermentation that tea is subjected to after its plucking. Tea processing involves plucking, withering, fermentation, rolling, drying and grading. Tea after plucking the leaves are:

- (a) steamed, rolled and dried without much fermentation to make Green tea.
- (b) straight away dried, crushed and stored in a

temperature and humidity controlled facility for fermentation for a longer period to make black tea.

- (c) dried, crushed and stored in a temperature and humidity control facility and allowed to ferment for a very short period to make red tea or oolong tea or semi fermented.

Tea as a Nutraceutical drink:

Tea is a refreshing and pleasant drink with invigorating properties. Many health promotive and protective properties are attributed to tea. Green tea specifically has been associated with protection against certain types of cancers such as lung cancer, stomach cancer and its pre-cancerous conditions etc. Several other unspecific medicinal effects are also attributed to tea. Detailed scientific investigation and chemical studies of tea were undertaken by many workers. Latha et al (2000) reviewed the medicinal properties of tea. Some of the important work on the therapeutic effects of tea are given below:

Antimutagenic and anticancer effects:

Green tea polyphenols are reported to have significant antimutagenic and anticancer effect (Fugita et al, 1989, Agnihotrudu, 1991) Green tea polyphenols also inhibited tumour cell DNA synthesis and peroxide radical generation. (Lin et al, 1996). Green tea tannins have antiproliferative effects on smooth muscle cells (Yokozawa et al, 1995). Tea is protective against the side effects of anticancer drugs (Sur and Ganguly, 1994). Polyphenols of tea especially catechins block biosynthesis of endogenous nitrosoamines, which could ultimately cause cancer. (Jing, 1987). Work done in China showed that green tea inhibited aflatoxin induced liver cancer (Ruiqui et al, 1987). A correlation has been made of the high selenium content of tea and the less incidence of cancer in Japan. (Ziquing, 1987). Stagg and Millin (1975) reported that lung neoplasia induced by urethane is reduced in animals treated with oolong tea. Jing (1987) reported that polyphenols of tea especially catechins block biosynthesis of endogenous nitrosamines, which could ultimately

cause cancer. Uemura et al, (1995) reported that tea leave saponin is a useful biological response modifier. These studies have demonstrated the protection effect of tea from possible cancer.

Antioxidant effects:

Natural antioxidants from green tea polyphenols have been patented. Tea catechins exhibit significant antioxidant activity on different lipid systems (Shiraki et al, 1994; Huang et al, 1997). Tea pigments could be used as food additives, being antioxidants. Green and black tea have higher antioxidant activity against peroxide radicals than many vegetables. (Cao et al, 1996). Tea flavonol's powerful antioxidant activity is related to its antimutagenic potential (Yen and Chen, 1995). Drinking green tea would contribute to maintain plasma catechin levels sufficient to exert antioxidant activity against modification of lipoproteins (Nakagawa et al, 1997).

Antioxidants have many health protective proportions including the anti aging properties. A recent WHO's observation of the health status of the people of the world is worth mentioning here. According to the report the people of only three countries of the world have the best health. They are the people of France, Japan and China. The high health status of the people of France is attributed to their red wine drinking habit. Red wine is very rich in powerful antioxidants like polyphenols. Japanese high health profile attributed to both tea and red wine drinking whereas the Chinese high health profile is attributed to the green or red tea drinking as well as use of soybean in their diet. The skin of Chinese, particularly the older people has glowing young look and the same is attributed to the liberal drinking of tea by them.

Antidiabetic effects:

Blood glucose levels are significantly reduced by tea catechins (Akinanju et al, 1967; Matsumoto et al, 1993). Polysaccharides prepared from tea are used as hypoglycaemics and antidiabetics (Masao et al, 1988). Consumption of oolong tea extract led to reduced blood glucose levels.

Antiatherosclerotic and cardiovascular effects:

Tea pigments can be used in prevention of atherosclerosis (Lou et al, 1989). It considerably reduced serum cholesterol and triglyceride levels (Muramatsu et al, 1986; Agnihothrudu, 1991). Tea stimulates degradation of triglycerides in adipose tissue, thus reducing body weight (Agnihothrudu 1991). Green tea catechin had profound influence on lipid metabolism as per work done at Shizuoka University, Japan (Muramatsu et al, 1986). Tea flavonoids act as anticoagulants and inhibit platelet aggregation induced by certain chemicals. Tea pigments reduced fibrinogen in cardiovascular diseases (Agnihothrudu, 1991).

Antihypertensive effects:

Tea leaf saponins showed significant antihypertensive effects (Agnihothrudu, 1991). Black tea inhibited angiotensin converting enzymes (Sagesaka et al, 1996) and thereby gives the antihypertensive effect.

Antibacterial, antifungal, anti HIV effects:

The flavons isolated from tea was found to be a very effective antibacterial and antifungal agent (Vijaya et al, 1995; Sagesaka et al, 1996). Aqueous extract of green tea inhibits bacterial growth (Mahajan et al, 1991). Green tea flavour components also showed antimicrobial activity (Kubo et al, 1992). Tea polyphenols showed significant inhibitory effects on HIV replication in H9 lymphocyte cells and served as anti-HIV agents (Hashimoto et al, 1996). There is also evidence that catechins from tea could be a novel class of inhibitors for HIV reverse transcriptase and DNA polymerase (Agnihothrudu, 1994).

Miscellaneous effects:

Tea polyphenols inhibited growth of oral bacteria and thus prevented dental caries (Sakanaka et al, 1996). Green tea had a positive effect on alcohol metabolism (Kakuda et al, 1996). Green tea and tea catechins are supposed to have a growth promoting effect on mammary glands (Sayama et al, 1996). Consumption of tea is likely to enhance antiasthmatic, anti-inflammatory and

antiallergic effects (Shiosaki et al, 1997). The permeability of capillary walls is reduced and their rupture resistance is enhanced by tea. Tea extract facilitates skeletomotor function by its action on calcium channels (Das et al, 1994). Oral administration of tea significantly increased potential energy in toad muscle and delayed development of fatigue (Koby, 1978). It is known to alleviate post game fatigue in players and sportsmen (Krishnamurthy, 1991). In Tibet, it is given to horses to increase their capacity to work (Emboden, 1971). Tea aids digestion and helps to maintain the body's fluid balance, It exhibits antiageing effects (Agnihothrudu, 1994).

Thus, it can be concluded that tea phytochemicals have immense health promotive and disease preventive properties. Tea is, therefore, one of the best nutraceuticals. However, it would be worthwhile to remember that like any other beverage or drink, tea may also produce unwanted side effects if consumed in an undesirable manner. Consumed in excess, tea causes a condition called Teaism, a kind of narcotic effect, which may be deleterious to the human body. Teaism is characterized by gastric disorders, pale or yellow skin, nervous disorders, hypochondria, sight disturbances, liver malfunction and chromosomal breakage (Emboden, 1979).

Tea as cosmaceuticals:

Beside the health protecting/disease preventing qualities, tea is also a source of cosmetics. Tea can be used as a natural beauty aid for the enhancement of looks. Tea is a natural hair colour. Brew a pot of medium strength tea, strain and cool it, then use the cool tea to rinse the hair. This will give a glossy attractive sheen on the hair. The grey hair is lightened and dark hairs highlighted, thereby giving an overall glossy look. Tea is brewed with henna (the leaves or *Lawsonia inermis*) cooled, added with curd and kept in an iron container for few hours. This paste is smeared on the hair and left to dry for some time and then washed. This will impart a glossy, lusturous and silky look to the hair.

Tea is an invigorating tonic to skin. Soak cotton

wool in cold tea, preferably made from green tea and apply it on the skin for the desired results.

References;

- Abbas A.B. Copeland E., Clifford M.N., Walker R., Loannides C. (1997) *Journal of Science of Food and Agriculture* 75:453-462.
- Agnihothrudu V. (1991) Tea – A herbal drink in: Raychaudhuri SP (ed) *Advances in Medicinal, Aromatic and Spice Crops*. Vol. 1. Today and Tomorrow Publishers, New Delhi, pp 63-68.
- Agnihothrudu V. (1994). Tea – A Herbal Drink for Health. in: *Proceedings of the International Conference on Current Progress in Medicinal and Aromatic Plant Research*. Culcutta, pp 75-75.
- Ageel A.M. (1989) *Oriental Journal of Chemistry* 5:77-80.
- Akinyanju P. Yudkin J. (1967) *Nature* 214:426-427.
- Cao G., Sofic E., Prior R.L. (1996). *Journal of Agricultural and Food Chemistry* 28:15-18.
- Das M., Vedasiromany J.R., Chauhan S.P.S. El Tahir K.E.H. Farharan M.A.M.
- Emboden W. (1979) *Narcotic Plants*, Studio Vista, London, pp 134.
- Fujita Y., Yamani T., Tanaka M., Fujiki H. Okuda T. (1989) *Japanese Journal of Cancer Research* 80:503-505
- Ganguly D.K. (1994) *Planta Medica* 60:470-471.
- Graham H.N. (1991) In: Yamanishi T. (ed) *Proceedings of the International Symposium on Physiological and Pharmacological effects of Camellia sinensis (Tea)* New York, pp. 1-2.
- Hashimoto F., Kashiwada Y., Nonaka G.I., Nohara T., Lee K.H. (1996) *Bio-organic and Medicinal Chemistry Letters* 6:695-700
- Hill A.F. (1951) *Economic Botany*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, pp. 472-476.
- Huang S.W., Frankei E.N. (1997) *Journal of Agricultural and Food Chemistry* 45:3033-3038.
- Jing T. (1987) In: *International Tea – Quality Human Health Symposium* Chinese Academy of Science, China pp 123.
- Kakudo T., Sakani I., Takihara T., Tsukamoto S. Nagoya T. (1996). *Bioscience, Biotechnology, Biochemistry* 60:1450-1454.
- Koby R. (1978) *Indian Journal of Physiology and Allied Sciences* 32:158-163.
- Krishnamurthy K.K. (1991) In: Yamanishi T. (ed) *Proceedings of the International Symposium on Tea Science*, Japan pp. 6-11
- Kubo I., Muroi H., Himejima M. (1992) *Journal of Agricultural and Food Chemistry* 40:245-248.
- Latha, P.G., V.V. Asha, S.R. Suja. S., Rajasekharan and P. Pushpangadan (2000) 7: pp 15-18.
- Lin YL. Juan I.M., Liang Y.C. Lin J.K. (1996) *Journal of Agriculture and Food Chemistry* 44:1387-1394.
- Lou. T. (1989) *Chinese Medical Journal* 102:579-583
- Mahajan V., Arora D.S., Sabhawal U. (1991) *Indian Journal of Microbiology* 31:443-445.
- Masao M., Naomasa M., Kenjiro L. (1998) Japan Patent No J.P. 63, 308.001. Japan Kokkai Tokkyo Koho.
- Matsumoto N., Ishigaki F., Ikshigaki A., Iwashina H., Maray T. (1993) *Bioscience. Biotechnology, Biochemisktry* 57:525-527.
- Muramatsu K., Fukoya M., Haray (1986) *Journal of Nutritional Science and Vitaminology*, 32:613-622
- Nakegawa K., Okuda S., Miyazawa T. (1997) *Bioscience, Biotechnology, Biochemisktry* 61:1981-1985.
- Rajasekharan S. (1993) *Mayakkumarun-nukal, Madakadravyangal (In Malayalam) Drugs and Narcotics*. State Institute of Languages, Trivandrum.
- Ruirong W., Yiping L. Hongyu C. (1987). In: *Proceedings of the Symposium on International Tea-Quality-Human Health*. Chinese Academy of Sciences, China pp-118.
- Ruiqui Y., Gouzhong Q., Zhiying C., Yuan L., Liuliang Q. (1987) in: *Proceedings of the Symposium on International Tea – Quality – Human Health*, Chinese Academy of Sciences, China, PP. 128.
- Sangesaka Y.M., Uemura T., Suzuki T., Yamaguchi K. Kyuki K. (1996) *Yakugaku Zasshi* 116:238-243.
- Sakanaka S., Aizawa M., Kim M. Yamomoto T., (1196). *Bioscience, Biotechnology, Biochemistry* 60:169-170.
- Sayama K., Ozekilk, Taguch M., Oguni M. (1996) *Bioscience, Biotechnology, Biochemistry* 60:169-170.
- Shiosaki T., Sugiyama K., Nakazato K., Takeo T. (1197) *Yakugaku Zasshi* 117:448-454.
- Shiraki M. Hara Y., Osawa T., Kumon H. Nakayama T., Kawakishi S. (1994) *Mutation Research* 323: 29-34.
- Stagg G.V., Millin D.J. (1975) *Journal of the Science of Food and Agriculture* 26: 1439-1440 .
- Sur P., Ganguly D. (1994) *Planta Medica* 60: 106-109.
- Uemura T., Sagesaka Y.M., Okada S. (1995) *Yakugaku Zasshi* 115:528-536.
- Vinson J.A., Dabbagh Y.A., Serry M.M., Jang J. (1995) *Journal of Agricultural and Food Chemistry* 43:2800-2802.
- Vijaya K., Ananthan S., Nalini R. (1995) *Journal of Ethnopharmacology* 49: 115-118.
- Warrier P.K., Nambiar V.P.K., Raman-kutty C. (1995) *Indian Medicinal Plants – a Compendium of 500 species*. VolL 1 Kottakal Arya Vaidya Sala, Kottakal.
- Yen G.C., Chen H.Y. (1995) *Journal of Agricultural and Food Chemistry* 43:27-32.
- Yokozawa T., Oura T., Nakegawa H., Kim M. (1995) *Bioscience, Biotechnology Biochemistry* 59:2134-2136.
- Zhao Z. Huang, *Biotechnology M.*, Qi L.M. (1992) *Chinese Journal of Traditional and Western Medicine* 12:620-621.
- Ziquing M. (1978) In: *Proceedings of the Symposium on International Tea – Quality – Human Health*, Chinese, Academy of Sciences, China, pp. 166.