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TRADITIONAL INDIAN SPICES AND THEIR HEALTH SIGNIFICANCE

Healthcare

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ABSTRACT

India has been recognized all over the world for spices and medicinal plants. Both exhibit a wide range of physiological and pharmacological properties. Current biomedical efforts are focussed on their scientific merits, to provide science- based evidence for the traditional uses and to develop either functional foods or nutraceutical. The Indian traditional medical systems use turmeric for wound healing, rheumatic disorders, gastrointestinal symptoms, deworming, rhinitis and as a cosmetic. Both turmeric and curcumin were found to increase detoxifying enzymes, prevent deoxyribonucleic damage, decrease mutations and tumour formation and exhibit antioxidative potential in animals. Recently several molecular targets have been identified for therapeutic /preventive effects of turmeric. Fenugreek seeds, a rich source of soluble fiber used in Indian cuisine reduces blood glucose and lipids and can be used as food adjuncts in diabetes. Similarly garlic, onions and ginger have been found to modulate favourably the process of carcinogenesis.

KEYWORDS

Turmeric, deoxyribonucleic acid damage, tumours, mutations, detoxification

INTRODUCTION

Mounting health care costs and increased desires to maintain good health and quality of life have focussed the researchers and public health scientists' attention on the diet, phytonutrients, disease prevention and health promotion. Biomolecules in the plants play a crucial role in health maintenance and promotion (Watson, 2001). In Asian countries particularly, India, China, Japan and Korea: there is a longstanding tradition and culture of attributing healing properties to foods and plant materials. They have an extra- ordinary place in the realm of traditional cures as medicines (Valiathan, 2004). There is a treasure house of knowledge, which needs to be explored to establish the scientific basis of its benefits. Phytochemical in spices, which primarily serve in plant protection, are considered vitamins of the 21 st Centaury. They are also less toxic compared to drugs. This article captures some recent scientific findings on turmeric, fenugreek, mustard, ginger, onions and garlic, which are common spices and have a distinct place in folk medicine in several of Asian countries.Studies on turmeric.

Turmeric cultivation in India occupies 60% of the total areas intended for spices and condiments. It is only an ancient but also a highly cultivated Asian spice and used in countries like India, China, Malaysia, Pakistan, Bangladesh and other Asian nations. Traditionally turmeric is used in a variety ways for different diseases, due to its kaleidoscopic properties (Krishnaswamy, 2006), for example as a general tonic, stimulant, cosmetic and for the treatment of coughs, colds, soar throats, asthma and dyspepsia including ulcers. It is used as deworming agent and as a paste for some viral disease such as chicken pox, small pox and measles. It is liberally used in arthritis and for wound healing. These traditional uses are a reflection of its pleiotropic effects. Current literature abounds in scientific evidence supporting its traditional uses and evidence based science clearly shows that turmeric and its active constituents, particularly curcuminoids can be used for a variety of disorders (Krishnaswamy, 2006).Turmeric is a popular spice derived from the root of Curcuma longa Linn, a member of ginger family. The powder and its active principle, a group of curcuminoids, are widely used as: culinary spices, preservatives, food additives, cosmetics and as oleoresins in food and pharmaceutical industries. In the last two decades, there has been considerable interest among the biomedical scientists to explore the possible therapeutic benefits of turmeric and its active principle, curcuminoids. A considerable amount of work has been carried out to explain its molecular, cellular, biochemical and pathological mechanism to establish its potential as a therapeutic agent for many chronic diseases (Aggrawal et al, 2003).

Chemical and nutritional composition Curcuma longa Linn or turmeric is a tropical plant native to South and Southest tropical Asia. It is a rhizomatous herb that belongs to the family Zingiberaceae. The major spice is genus Curcuma longa Linn which is of commercial value. The rhizomes, on maturity, are steeped in boiling water, sundried and polished to obtain the turmeric sticks. The powder used in various dishes. Turmeric contains essential oils, fatty oils and 2-5 % cuminoids (Govindarajan 1980).Certain varieties contain upto 90 % curcuminoids. It has all proximate principle such as carbohydrates, proteins and fats and provides all nutrients in small quantities. Turmeric is fairly rich in omega-3 fatty Curcuminoids are polyphenolic compounds with beta diketone moiety. The three types of curcuminoids, namely Curcumin 1, 2 and 3, differ with regard to their hydroxyl and methyl group. Current efforts in research are focussed on evidence- based science to determine the functional benefits of the bioactive compounds (Krishnaswamy, 2006). Whole turmeric or the extracted curcuminoids appear to be active in many disease processes with specific reference to chronic ailments such as cardiovascular, degenerative, infective and inflammatory disorders as well as cancers.

Antimutagenic effects

The antimutagenic potential of turmeric was assessed against the ubiquitous pollutant benzo(a) pyrene in rats. Turmeric, at 1, 5 and 10 % of the diet, were fed to the rats for three months. At the end of each month, after giving 5mg of benzopyrene per rat, urine samples were collected for 24 hours in which mutagens were quantitated. The salmonella strains of TA98 and TA 100 with and without S9 fraction were used for the quantitation of mutagens. Mutagens in urine were significantly reduced by dietary exposure to turmeric. No additional effects were observed beyond 1 month. Furthur studies were done with 0.1 and 0.5% turmeric with benzopyrene and 3methyl cholanthrene. Dose dependent results were observed with 0.5 % turmeric in the diet, indicating a potent effect even against a strong induced such as methylcholanthrene (Polasa et al, 1991). As curcuminoids are important constituents of turmeric and is similar to ellagic and ferulic acids which are antimutagens, the antimutagenic effects of curcuminoids were assessed in the animals with methods described in the previous study. Curcumin, with or without S9 fraction, significantly reduced mutagens at all levels within four weeks of feeding. The doses correspond to 0.5 % to 5% of turmeric in the diet. The parahydroxy groups/ diketone moiety are considered important for activity (Krishnaswamy and Raghuramulu, 1998).

Protective effects on deoxyribonucleic acid (DNA)

In rats treated with dietary turmeric and curcumin for one month, both the number of adducts and the microgram of adducted DNA were significantly impacted by 0.1% turmeric and 0.03% of curcumin. This was determined with the use of P32 post label assay. The percentage of reduction ranged from 61 to 70 % for 0.1 to 3 % turmeric respectively while curcumin (0.03%) resulted in 92 % reduction (Mukudan et al, 1993).

A more recent study showed that breaks in the DNA stand in the periphery cells were effectively repaired by curcumin and S.cerevisiae exposed to gamma radiations. The protective effect of curcumin on B(a) P induced DNA damage in human periphery blood, as assessed by comet assay, showed a dose-dependent inhibitory effect .(Polasa et al, 2004)

Turmeric and curcumin on xenobiotic metabolism

Ingested environment chemicals need to be eliminated from the body to protect against toxicity. The body has a defence system in the form of drug metabolising enzymes located in the GI tract and liver and certain extra hepatic tissues like the kidneys and lungs. The liver and GI tract acts as first line of defence against lipophilic substances. Several plant materials known to be inhibitors of carcinogenic process are reported to enhance the host detoxification mechanism and act as blocking agents. Enzymes such as aryl hydrocarbon hydroxylase (AHH), Uridine diphosphoglucuronide transferase (UDPGT) and Gluthathione-S-transferase (GSHT) were therefore assessed in rats after 4 weeks of turmeric and or curcumin feeding.The AHH was not altered either by turmeric or curcumin feeding neither in the liver nor in the GI tract. However, GSHT activity was significantly elevated both in the liver and in the intestine at low levels of turmeric and curcumin intake. Elevation ranged from 25-30 %.GSHT is one of the versatile enzymes that mop up electrophilic substance. The increased in GSHT activity in animals fed large amounts of cruciferous vegetables and fruits correlates well with their anticarcinogenic potential in forestomach tumours induced by B(a) P. The non- stimulatory effect of turmeric and curcumin on AHH as against inducing effects on GSHT would ultimately decrease the load of carcinogen on the body (Goud et al, 1993).Several other enzymes such as quinine reductase, epoxide and hydrolase are also increased by both turmeric and curcumin (Krishnaswamy, 2006).

Turmeric and curcumin as antioxidant

Turmeric and curcumin show antioxidant activity in vitro. The antioxidant effects of turmeric and curcumin were therefore evaluated in vivo where oxidant damage was induced by paracetamol and DMBA. Markers such as MDA levels as an indicator of lipid peroxidation, glutathione in liver homogenate, superoxide dismutase and glutathione peroxidise were estimated. Thiobarbituric acid reactive substance were much lower in turmeric and curcumin treated rats when compared to control and so was the case with ALT levels in serum, indicating that liver damage due to the paracetamol ,metabolite N-acetyl amino- paraamino benzoquinone was counteracted by curcumin. This suggests that the oxidative metabolite of paracetamol is detoxified by increased activity of GSHT (Krishnaswamy, 2006).

Tumour inhibition

As oral cancers are highly prevalent in India, the experimental model of hamster cheek pouch was employed to study the effect of turmeric and curcumin on DMBAinduced tumour genesis. The burden of tumour and the number of tumours per animal were significantly reduced at 1% turmeric in the diet. The tumours were larger in size in the control group as compared to those that received either turmeric or curcumin (Krishnaswamy et al, 1998). However, curcumin effects varied between groups.Since GI tract tumours such as oesophageal and stomach cancers are widely prevalent in several states of India, it was considered necessary to assess its effects on the initiation promotion model of fore-stomach tumours, induced by B(a)P, in mice. Histopathological grading was done on a scale of 1-10 of which 6-10 is malignant proliferation. The proliferation index in the treated groups was significantly lower. Turmeric was effective during both the initiation and post-initiation phases while curcumin appears to be effective only during the initiation phase, with minimal effects on post-initiation phase. From a pathological point of view, the evolving carcinogenic process is a sequential changes from a normal homogeneous group to a more heterogeneous group and turmeric appears to control premalignant and precancerous lesions as well malignant transformation (Krishnaswamy, 2003).

Toxicity

Turmeric has been in use from time immemorial as flavouring and colouring agent and in folklore as a medicament. Toxicology studies on curcumin in various species of animal have yielded no toxic effects. Human clinical trials have demonstrated no toxic effects at doses of 1-8g/day /6-8 months (Nirmala et al, 2007)

Effect of turmeric

As turmeric, in the Indian culinary practices , is usually either boiled or fried, the antimutagenic effects of boiled or friend turmeric were assessed in E.coli PQ37 based on the measure of SOS DNA repair (Krishnaswamy et al. 1998). It was evident that boiled or fried turmeric evoked a similar SOS response, indicating that cooking at high temperature is unlikely to destroy the antimutagenic potential of turmeric.

Fenugreek and its biological effects

Fenugreek, a native of south East Europe and West Asia belongs to the family of Leguminacae and its an annual herb. The dried seeds of fenugreek are used as a spice while the leaves are used as a vegetable in the Indian culinary arts. Fenugreek seeds is a rich source of protein, fibre and omega 3 fatty acids while the leaves are sources of beta-carotene, iron , calcium, magnesium, potassium and vitamin C. India is one of the major producers and exporters of fenugreek.

Hypoglycemic effect

Since fenugreek is a rich source of soluble fibre, several experiments were performed in animals to assess its effects on lipids and blood glucose. In metabolic study with a crossover design in NIDDM patients, when 100 g of defatted fenugreek seed powder was administered for a period of 10 days, significant reduction in glucose levels and increased glucose tolerance was observed (Raguram, 1996). A reduction in serum insulin level was also documented. When subjects received fenugreek for a period of 10 and 20 days, there was not only a significant reduction in blood glucose but also a significant reduction in cholesterol, triglycerides and urinary sugar levels. The gel forming characters of fenugreek fiber reduces gastric emptying, glucose absorption and the insulin response. In majority of patients, a mild improvement in clinical symptoms such as polydipsia and polyuria were observed with a reduction in antidiabetc drug doses. Incorporating just around 25 g fenugreek seeds in the daily diet can serve as an effective supportive therapy in the management of diabetes. A study on glucose disposition was undertaken in type 2 diabetes before and after a diet consisting of fenugreek (25 g) in unleavened bread. During the experimental period, the intake of fiber was 42 g as compared to 30 g in the control group. There was a significant reduction in the area under the plasma glucose curve (AUC). The half life of glucose was shorter and metabolic clearance of glucose was higher, RBC insulin receptors registered a significant increase. The results of the insulin binding sites coupled with the observation on insulin levels indicated better peripheral glucose utilization. Recent studies attribute the hypoglycaemic effects to the amino acid, 4-hydroxyisoleucine which may have effects on pancreatic beta cells.

Biopotency of onion, garlic, mustard and ginger

Garlic and ginger have many therapeutic attributes . Antimicrobial, antithrombotic, anti-inflammatory and anticancer activity have been reported, 15, 16. Spices such as mustard, allium and ginger have been demonstrated and preventers DNA damage in vitro (Polasa et al, 1994, and Nirmala etal, 2007).

CONCLUSION

The relevance of the innumerable actions of spices shown in vitro, have to be demonstrated in vivo. The diversity of their cellular actions supports their beneficial effects on various chronic diseases. More rigorous clinical trials are needed to determine long –term benefits. The integration of knowledge is required to determine their effect in natural human settings. Turmeric through its beneficial effects, truly a spice of life. Food based approaches for enhancing the intake of spices and phytochemical can offer an avenue to greatly impact the onset and progression of chronic diseases, oxidant stress and ageing. Although the chemopreventive approach is a recognized strategy, public health action should be directed at increase in the consumption of foods/herbs/spices/beverages, which posses a package of protective phytonutrients. The phytoprotectants act as bioenhancers of several physical and biochemical processes. For chronic disorders, chemopreventive may not be a feasible strategy except for individual at risk. Dietary prescription as a public health measure will be sustainable and cost effective. Spices such as turmeric, fenugreek, mustard, ginger, onion and garlic have a wide variety of biofunctions and their additives or synergistic actions are likely to protect the human body against a variety of results. Traditionally spices, as part of diets, have holistic effect on human health.

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